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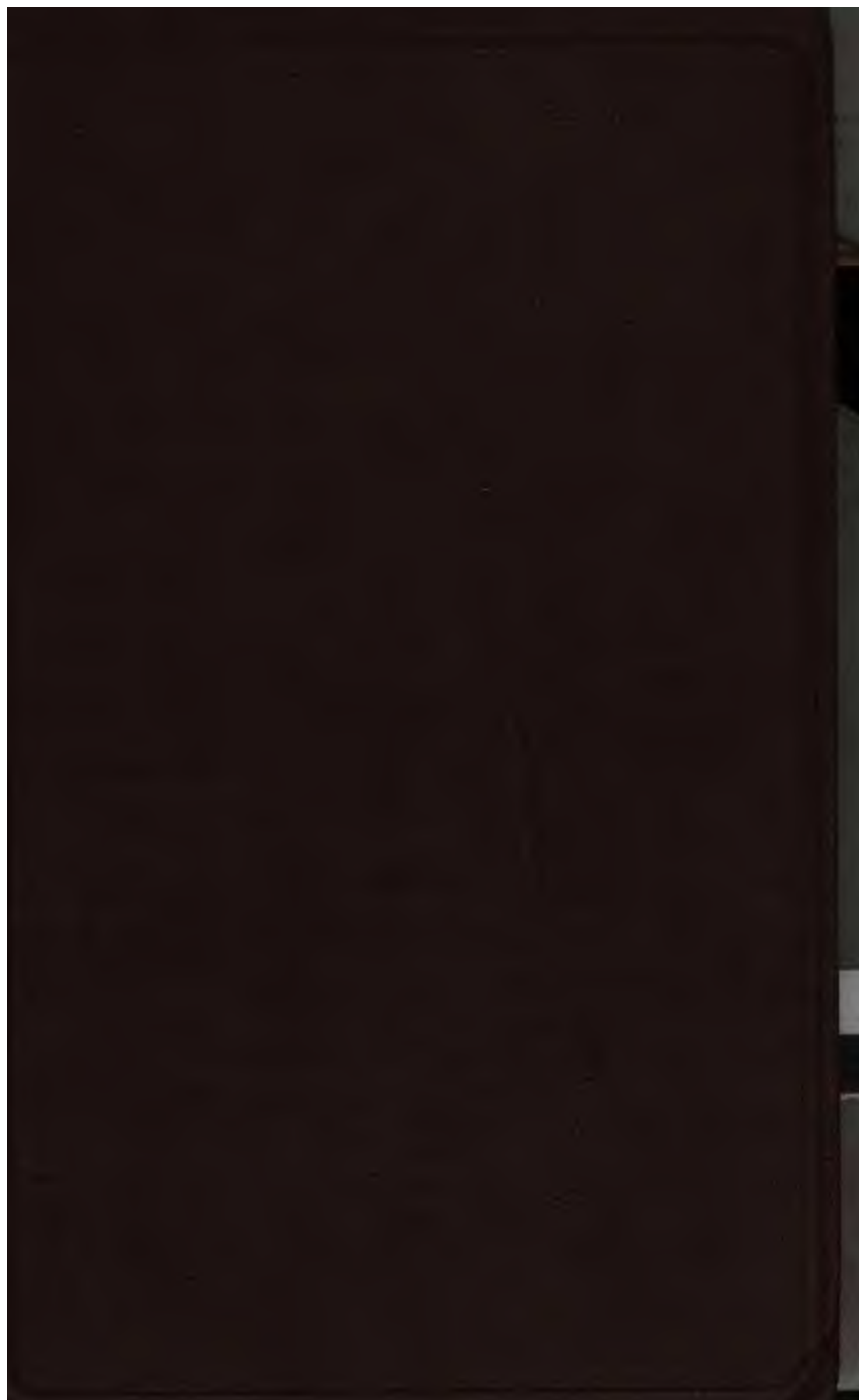
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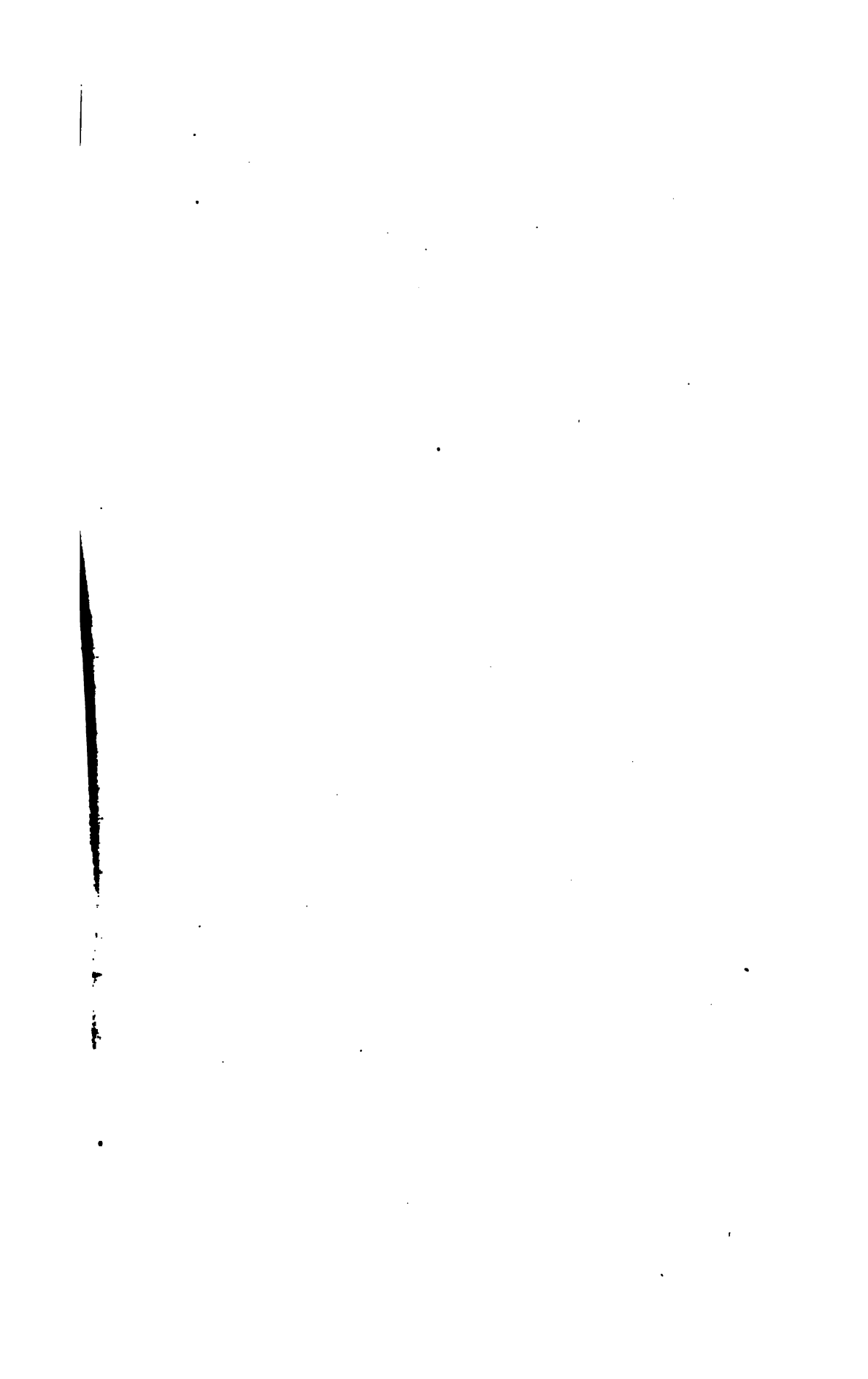




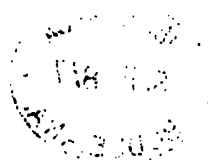
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DISEASES
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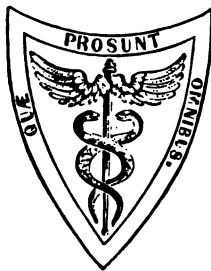
A
PRACTICAL TREATISE
ON THE
DISEASES, INJURIES, AND MALFORMATIONS
OF THE
URINARY BLADDER,
THE
PROSTATE GLAND, AND THE URETHRA.

BY
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THIRD EDITION,
REVISED AND EDITED

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ILLUSTRATED BY ONE HUNDRED AND SEVENTY ENGRAVINGS.



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P R E F A C E.

A NEW edition of this work having been called for, after having been out of print for several years, I have entrusted its revision to my son, Dr. S. W. Gross, who has rewritten the greater portion of it, and brought it fully up to the existing state of our knowledge. As he has delivered several courses of lectures upon the affections of the urinary organs in the Jefferson Medical College, and has devoted much study and attention to their practical details, I felt satisfied that the task would be thoroughly executed. The chapters on Tumors of the Bladder and of the Prostate Gland, which add largely to the value of the work, are entirely due to his pen. It is proper to observe that the anatomy of the urinary organs, and the appendix in relation to the prevalence of stone in the bladder and calculous disorders in the United States, inserted into the former editions, have been omitted in this. To Dr. C. H. Mastin, of Mobile, Alabama, I am indebted for the statistics of lithotomy as performed by American surgeons; and I am also under obligations to Dr. Barnes, Surgeon-General U. S. Army, for several engravings illustrative of various topics discussed in these pages.

S. D. GROSS.

JEFFERSON MEDICAL COLLEGE,
PHILADELPHIA, September, 1876.

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DISEASES OF THE URINARY ORGANS.

PART I.

DISEASES AND INJURIES OF THE BLADDER.

CHAPTER I.

INFLAMMATION OF THE BLADDER AND ITS RESULTS.

INFLAMMATION of the bladder, technically termed cystitis, generally begins in the mucous membrane, and presents itself under two varieties of form, the acute and chronic. Of these, the first is exceedingly infrequent, while the chronic form of the malady, on the contrary, is sufficiently common, and often entails a vast amount of suffering, which, continuing for months, and perhaps years, finally brings the patient to a premature grave.

Some modern writers subdivide this disease as it affects one or more of the coats of the bladder. Thus, when the serous covering and its subjacent tissue are alone involved, it is termed serous cystitis, or epicystitis, of which extremely rare occurrence it need only be said that it is nothing more than a circumscribed peritonitis, resulting from extension of inflammation from the other tissues, or appearing as a metastatic phenomenon in the course of pyemia, typhus, and the exanthemata, and liable to be attended with the formation of abscesses, which open into the urethra, the bladder, the vagina, or the rectum. When all the coats are implicated, it is termed interstitial, or parenchymatous cystitis, which is discussed further on under the head of suppuration and abscess of the bladder. Finally, when the mucous membrane and submucous connective tissue alone participate in the morbid action, it is known as mucous cystitis, the ordinary form of the disease.

SECT. I.—ACUTE INFLAMMATION.

Acute cystitis usually occurs in irregular, circumscribed patches, although the entire mucous membrane may be invaded. Any portion of the organ is liable to suffer, but the parts most frequently affected are the neck and bas-fond. During its progress the morbid action often spreads from the mucous membrane to the submucous connective tissue, and from thence to the muscular tunic. The peritoneal investment is rarely implicated, in any considerable degree, however serious the attack.

The causes of acute cystitis are the imprudent use of cantharides, oil of turpentine, nitrate of potassa, and other stimulating articles; contusions of the perineum and hypogastrium, from blows, kicks, or falls; the extension of gonorrhœa, and inflammation of the prostate; the injection of irritating fluids; and the rough use of catheters, bougies, lithotrites, and sounds.

Occasionally it is traceable to the effects of excessive venery, and to inordinate distention of the bladder from neglect to void the urine. Sudden transition from heat to cold, and the repulsion of cutaneous eruptions, also produce acute cystitis, especially in persons of a gouty and rheumatic habit. But the most frequent causes, without doubt, are wounds of the bladder, the presence of calculous concretions, rough horseback or carriage exercise, the intemperate use of stimulating drinks, and injury sustained during parturition, whether from the pressure of the child's head, or the injudicious use of instruments. Finally, we must not omit, in this list of exciting causes, to mention protracted retention of altered urine, from enlargement of the prostate, stricture of the urethra, and paralysis of the organ, which, it is well known, often awakens violent and even fatal cystitis.

Acute cystitis is more common in adults than in children and old people, in the strong and robust than the weak and sickly, and in men than in women. It also occurs more frequently in autumn and winter than in spring or summer, and in cold than in warm climates. Various circumstances, such as an arthritic diathesis, intemperance in eating and drinking, and permanent obstacles to micturition, predispose to its development.

The minute features of acute inflammation of the mucous membrane of the bladder are hyperemia, epithelial hyperplasia,

and thickening of the subepithelial connective tissue, as indicated by increased vascularity, the discolored patches being pervaded by fine or coarse capillary vessels, and exhibiting, in some cases, points of ecchymosis, loss of transparency, softening, and tumefaction, with alteration of the natural secretion. At the commencement of the disease, the secretion of mucus is somewhat augmented in quantity, but thinner and less viscid than in the natural state. When at its height it is almost entirely suppressed, and the membrane is consequently somewhat dry; but as this period is always of short duration, the secretion is soon reëstablished, and often exists in great abundance, being of a thick, ropy consistence, and of a pale straw, grayish, drab, or greenish color. In the higher grades of the disease, the secretion, instead of being mucous, is puriform or muco-purulent, and tinged with blood, which seems to be poured out, under these circumstances, in the form of an exhalation, though occasionally it is no doubt caused by a laceration of some of the capillary vessels.

In violent attacks, the inflammation is no longer limited to the mucous and other tunics of the bladder, but it extends to and involves the surrounding and associated organs. The parts which are more particularly liable to suffer are the ureters and the prostate gland. Along the former the morbid action is propagated to the kidneys, giving rise either to derangement of their functions, or pyelitis, which is not an uncommon cause of death. The mucous lining of the ureters, from one extremity to the other, is abnormally red and turgid, and their inferior outlet is sometimes almost obliterated, or choked up with lymph, mucus, or pus, or by all these fluids variously combined with each other. The prostate gland may be considerably swollen, especially when the disease affects the neck of the bladder, and thus seriously complicate the primary disorder, by increasing the local distress, and serving as a mechanical obstacle to the evacuation of the urine.

Acute cystitis is generally ushered in by bold and well-marked symptoms. The first which usually attracts attention is a dull, obscure, deep-seated pain, or rather a sort of gnawing uneasiness, in the region of the bladder, which, rapidly increasing in intensity, soon extends to the neighboring organs. At this early stage, there is little or no constitutional disturbance; or,

if there be any disorder of this kind, it is manifested by slight chills alternating with flushes of heat, some thirst, and a little excitement of the pulse, which is, perhaps, somewhat more hard and frequent than usual. The patient now begins to experience frequent calls to void his urine, which is expelled in small quantities, or it may be drop by drop, accompanied with violent straining, distressing spasm, and a peculiar burning or scalding at the neck of the bladder and along the course of the urethra. The hypogastrium is distended, painful, and so exquisitely tender as to render even the weight of the bedclothes intolerable. The limbs are drawn up, and the body bent forward, to relax the abdominal muscles, and relieve the tension of the bladder. As the disease progresses, the desire to pass water becomes uncontrollable, the pain in the bladder assumes a lancinating, tearing, or throbbing character, and the small quantity of urine which dribbles off is thick, ropy, and turbid, reddish, or tinged with blood. The pain shoots along the testicles, groins, upper part of the thighs, and spermatic cords, to the sacrolumbar region, where it is often almost insupportable. It is augmented by the slightest movement of the body, by pressure and percussion, by the passage of the contents of the bowels, by the insertion of the finger into the rectum, and by the introduction of the catheter; but is somewhat relieved when the bladder is emptied of its contents. The perineum feels sore to the touch, and there is incessant vesical tenesmus, accompanied by a degree of straining, or bearing down, equal to what occurs in childbirth. Notwithstanding these efforts at micturition, which are sometimes almost without intermission, the urine, never being entirely expelled, gradually accumulates, and the bladder at length ascends above the pubes into the hypogastric region, forming a globular and elastic tumor, exquisitely sensitive under the slightest touch. In some cases there is, almost from the very commencement, a constant dribbling of urine, while in others there is complete retention of this fluid.

The urine, at first acid and of normal color, soon becomes alkaline and of a dirty drab, or deep red hue, from its admixture with blood. It contains mucus and epithelium, and, later in the disease, flakes of lymph and pus, which, if the fluid be permitted to remain at rest, subside to the bottom of the receiver, forming

a ropy, glutinous mass, equal to one-fifth, one-fourth, or even one-third of the entire excretion.

When the disease is fully developed, there is always more or less constitutional derangement, as indicated by the quick, hard, small, and frequent, or frequent and wiry pulse; the hot and dry skin; the coated tongue; the impaired appetite; the urgent thirst; the constipation of the bowels; the anxious and dejected countenance, and a state of constant restlessness and agitation. The limbs are drawn up as in acute enteritis, and there is generally great distress in the anus and rectum, from an extension of the inflammation. Nausea and vomiting, with severe precordial oppression, are rarely absent in this stage of the complaint, and there is occasionally complete suppression of the urine. Towards the close of the disease, the surface is bathed with a cold, clammy perspiration, and exhales a peculiar urinous odor; the mind wanders; hiccup supervenes; the strength rapidly declines; the countenance assumes a Hippocratic expression; the extremities become cold; and the patient finally sinks into a state of coma, from which he cannot be aroused.

Some diversity occurs in the symptoms of cystitis, dependent upon the particular seat of the morbid action. When the neck of the bladder is mainly affected, excessive pain and a sense of weight or fulness are experienced in the anus and perineum; there is obstinate retention of urine, with an incessant desire to micturate; and severe scalding or burning is felt along the urethra, from one extremity of it to the other. When the anterior wall of the bladder is inflamed, there is great tenderness on pressure and percussion, with a sense of constriction, in the hypogastric region; the patient lies on his side, and the knees are partially flexed, to prevent tension of the abdominal muscles. There is likewise, under these circumstances, less pain about the neck of the bladder, the desire to micturate is not so frequent, and the water can be retained longer and better. When the inflammation occupies the bas-fond of the bladder, the rectum is more apt to suffer, and the patient is harassed with constant straining and tenesmus.

Acute cystitis usually runs its course with considerable rapidity. It seldom continues beyond the sixth or eighth day without terminating in resolution, tending to suppuration, passing into gangrene, or assuming a chronic type. When the malady is

about to decline, there is a gradual abatement of the local and constitutional symptoms; but a sensation of numbness, weight, or uneasiness usually remains in the affected part after the violence of the disease has subsided.

The prognosis in cystitis depends upon the various circumstances enumerated among the exciting causes, and the possibility of removing them. When the inflammation is limited, the constitution sound, and the fever moderate, the disease generally yields very readily to treatment, and may even disappear of its own accord. When the system is enfeebled by previous suffering, debauch, or intemperance, death is apt to ensue from uremia, gangrene, or pyemia.

The treatment of acute cystitis is directed, first, to subduing constitutional excitement; and, secondly, to allaying local irritation. For accomplishing the first of these ends, the remedies mainly relied upon, in the earlier stages of the complaint, are general and topical bleeding, cathartics, and diaphoretics, aided by an antiphlogistic regimen. Promptly and vigorously employed, there are few cases of acute cystitis which resist these means beyond the second or third day, and such as do are always more easily managed afterwards by mild treatment. I have repeatedly cut short, by the lancet alone, attacks of this disease so severe as to leave the patient no rest, and so threatening as to induce the worst apprehensions for his ultimate recovery.

There is a variety of cystitis, properly denominated acute, as it respects the local distress, in which there is an entire absence of constitutional disturbance, and yet the suffering is exceedingly severe. In these cases there is no remedy, according to my experience, which is followed by such prompt and permanent relief as copious bleeding at the arm. The operation rarely requires to be repeated, and is generally sufficient, with the aid of a general laxative and a dose of Dover's powder, to effect a cure in thirty-six or forty-eight hours; sometimes, indeed, much sooner.

The bowels demand early attention, especially if they are overloaded with fecal matter, the pressure of which would prove injurious to the inflamed and suffering organ. Where there is no marked derangement of the biliary secretion, the best purgative is castor oil, or sulphate of magnesia, aided by an enema of cool water, thin gruel, or soapsuds. If an opposite condition

exist, a dose of calomel should be given, either alone, or, in urgent cases, in union with rhubarb and jalap. Under no circumstances is it proper to administer medicines calculated to irritate the lower bowel, and, through it, the urinary bladder.

As soon as proper depletion has been practised, and the alimentary canal well cleared out, diaphoretics are indicated, the one which I have found most useful being the tartrate of antimony and potassa, in the form of the antimonial and saline mixture, of which the dose is a tablespoonful every two, three, or four hours.¹ This seldom fails to produce copious diaphoresis, to allay vascular excitement, to calm the affected organ, and to keep the bowels in a soluble condition. Where the skin is already soft, or where a diaphoretic and opiate are required, nothing is so beneficial as Dover's powder, in doses of five grains, with the sixth of a grain of morphia, three or four times in the twenty-four hours. If the stomach is irritable, the effervescing draught is preferable to anything else.

The action of the above medicines may be favored by tepid drinks, the warm bath, and hot fomentations. The best drinks are such as are somewhat demulcent, as gum Arabic water, slippery elm water, rice water, or flaxseed tea, rendered palatable by the addition of a little lemon juice, citrate of potassa, or the neutral mixture. In the use of these and similar articles, care must be taken not to allow the patient to indulge so freely as to run the risk of producing too great a flow of urine; the object should be merely to allay the acrimony of this fluid, and to render it more acceptable, so to speak, to the suffering organ.

Diuretics, strictly so called, are improper in this affection, and should, therefore, be avoided. When the urine is acrid, high-colored, or very scanty, a small quantity of nitrate of potassa, or spirit of nitrous ether, mixed with some demulcent fluid, may, under such circumstances, be given to modify the renal secretion, and allay vesical irritation. In the gouty and rheumatic forms of the malady, colchicum, combined with morphia, is sometimes beneficial. In the later stages of the disease, an infu-

¹ The combination, which I am in the habit of using in this and other forms of inflammation, consists of two grains and a half of tartrate of antimony, two ounces of sulphate of magnesia, two grains of sulphate of morphia, a drachm and a half of tincture of veratrum viride, half a drachm of aromatic sulphuric acid, two ounces of syrup of ginger, and ten ounces of water.

sion of uva ursi and hops, in the proportion of one ounce and a half of the former, and half an ounce of the latter to the quart of water, often acts like a charm in the lighter grades of cystitis, in allaying pain and spasm at the neck of the bladder. An ordinary sized wineglassful of this should be given five or six times a day, either alone, or in combination with morphia and citrate of potassa or bromide of potassium, or the latter articles and balsam of copaiba.

Among the more important local remedies for arresting cystitis, and tranquillizing the affected organ, are, leeching and cupping, anodyne enemata, fomentations, and the hip-bath.

For an adult, in ordinary cases, fifteen or twenty foreign leeches applied to the perineum and verge of the anus, to the upper and inner part of the thigh, or when the summit of the bladder is affected, to the hypogastrium, will rarely disappoint expectation. The pain and distress in the back, which often constitute a source of so much suffering, are usually promptly relieved by the application of cups, either dry or wet, to the sacrolumbar region.

Of all the local remedies none hold a higher rank in the treatment of this affection than anodynes, administered by the rectum, either in the form of injections, or in that of suppositories. They not only allay pain and spasm, but they quiet the bladder, and render it more able to bear the presence of the urine, a desire to pass which is a principal cause of the patient's suffering. The best form of injection, for an adult, is from half a drachm to a drachm and a half of laudanum to two ounces of tepid water, thrown up with a vulcanized syringe, with a long nozzle, which is far preferable to all the patent contrivances of the kind of which I have any knowledge. The bowel should be previously cleared out with a purgative, or an enema, and care should be taken not to force the fluid against the anterior wall of the rectum. The best suppository is powdered opium, from two to four grains, thoroughly mixed with cocoa butter, and introduced upon the end of the forefinger, well oiled.

As auxiliary remedies, in the treatment of this disease, mention may be here made of fomentations with flannel wrung out of hot water, either simple, or medicated with laudanum, laudanum and camphor, poppies, or hops. To prevent evaporation, and confine the heat, the surface of the flannel should be covered

with a piece of oiled silk. Instead of fomentations, dry heat, applied to the hypogastrium and perineum by means of an India-rubber bag of special construction, filled with hot water, is exceedingly grateful to the affected part, as well as to the general system.

The warm hip-bath, or immersion of the entire body in warm water, is sometimes eminently serviceable in relieving the local suffering, and exciting the cutaneous emunctories. Generally speaking, the latter is to be preferred to the former, on account of the greater convenience and less fatigue which attend its administration, as well as the more thorough relaxation of the system. The temperature of the water should range from 85° to 92° , and the immersion should be continued from twenty minutes to an hour, according to the effects of the remedy, which should always be carefully noted.

The exciting causes of this disease lead to certain modifications of the treatment, which should be well understood by the practitioner. The principal circumstances which require to be considered in this relation are urinary concretions and other foreign bodies, the use of cantharides, the extension of gonorrhœal inflammation, the repulsion of gout, rheumatism, and cutaneous eruptions, stricture of the urethra, and enlargement of the prostate gland.

The treatment of cystitis, dependent upon the presence of a calculus, is to be conducted upon general principles; no effort should be made to extract the foreign body, much less to crush it, until the inflammation is subdued. The case is different when the cystitis has been induced by the presence of a foreign substance which has penetrated the bladder from without, as a splinter, or piece of bone. Here the first object should be to remove the extraneous body as early as possible, on the well-known principle that the disease induced by it cannot be cured so long as it remains in contact with the affected viscus.

Cystitis, caused by the absorption, or internal use of cantharides, requires a treatment somewhat peculiar. This variety of inflammation, technically called strangury, is induced by the specific action of cantharidin upon the neck of the bladder, terminating in a constant desire to pass water, accompanied with excessive pain and spasm at the neck of the organ, horrible scalding along the urethra, and sometimes the discharge of frag-

ments of fibrinous exudation, along with priapism. The symptoms are generally urgent, coming on within the first twenty-four hours, and, therefore, require prompt and vigorous interference. A large emollient poultice is applied to the vesicated surface, hot cloths are laid upon the abdomen, the perineum, and the genitals, and a drachm of laudanum, mixed with two ounces of tepid water, is injected into the lower bowel. Demulcent drinks, with spirit of nitrous ether, or liquor potassæ, are freely taken; and, in severe cases, a full anodyne is exhibited by the mouth. A popular remedy, of great value in this affection, especially in its milder forms, is a decoction of parsley root and watermelon seeds. It should be used as freely as the stomach will bear, either alone, or in combination with spirit of nitre and paregoric. There are few cases of strangury which resist these means, or which require more active treatment, as bleeding, purging, diaphoretics, and the warm bath.

Cystitis, occasioned by an extension of gonorrhœa, usually after the third week of its existence, is characterized by severe tenesmus, a frequent desire to micturate, and great pain in passing the last drops of urine, which is sometimes tinged with blood. The inflammation, which may occur at any period of the specific disease, is, in great measure, confined to the neck of the bladder, and rarely assumes a violent character. The treatment is antiphlogistic, aided by the internal exhibition of copaiba, and the use of anodyne enemata.

When cystitis depends upon a gouty or rheumatic state of the constitution, or upon a retrocession of these diseases, colchicum is indicated, and ought to be conjoined with other antiphlogistic means. One full dose, given at bedtime, is preferable to small ones, frequently repeated. Another valuable remedy in this variety of cystitis is calomel, administered with a view to its constitutional effects. In obstinate cases of this kind, it is, in fact, almost indispensable. It may be given, three or four times a day, in doses of two grains, combined with half a grain of opium, to prevent it from acting too freely upon the bowels, and aid in procuring sleep. As soon as the gums become tender, the mercury is discontinued, or administered in smaller quantity or at longer intervals.

When the malady has been induced by the sudden repulsion of some cutaneous disease, as herpes, urticaria, or erysipelas, the

indication is to reinstate the disease to its former situation, by the application of blisters, and the exhibition of such means as the state of the system may seem to require.

When the cystitis is complicated with, or dependent upon, stricture, or enlargement of the prostate gland, the treatment must be of a mixed character; an attempt being made, while we endeavor to cure the vesical symptoms, to relieve the pre-existent affection.

Finally, should retention of urine occur, no time is to be lost in having recourse to the gum-elastic catheter. This accident often ensues at an early stage of the disease, and always requires the closest vigilance on the part of the surgeon; for the accumulated fluid not only acts injuriously by distending the coats of the bladder, already crippled and enfeebled in consequence of the inflamed condition of its muscular fibres, but by undergoing speedy decomposition, whereby it becomes a source of direct mischief to the lining membrane. To prevent these evils, the catheter should be used every six or eight hours, or whenever, indeed, there is the slightest tendency to distention, care being always taken to withdraw it as soon as the urine has been evacuated.

SECT. II.—CROUPOUS INFLAMMATION OF THE BLADDER.

The mucous membrane of the bladder, like that of the alimentary and aerial canals, is liable to a form of inflammation, variously termed croupous, diphtheritic, fibrinous, plastic, exudative, and pseudomembranous. The term croupous, retained on the present occasion, includes that and the diphtheritic process, between which there are certain differences. In the former, the inflammatory new material, composed of a mass of germinal and metamorphosed epithelial cells and fibrin, is attached to the surface of the mucous membrane, where it may be found, in rare instances, on dissection, as a mould of the interior of the viscus. Such casts, which are usually covered with phosphatic deposits, give rise to retention of urine, and may even be expelled during life, when they are mistaken for exfoliations of the lining membrane, or even for the placenta, as has occurred in parturient females. In the diphtheritic variety of the affection, on the other hand, in which the pathological change consists in infiltration of the sub-

epithelial connective tissue with germinal cells, and which, therefore, does not show itself as a deposit, the infiltrated mucous membrane may be thrown off in the form of a complete cast of the bladder, as in the remarkable instances recorded by Luschka,¹ and Mr. Spencer Wells.² In the case of a malingering female, under the charge of Mr. Maunder,³ the supposed exfoliated mucous membrane turned out to be a bladder from one of the lower animals.

Croupous inflammation is exceedingly rare as an idiopathic affection; but occasionally occurs in association with the same disease elsewhere. As a secondary affection, it is met with in cholera, typhus, the exanthemata, and pyemia, and as a result of direct violence, and the irritation produced by decomposing urine, carcinoma, calculi, and foreign bodies. The presence of a pseudomembrane, of a quarter to half a line in thickness, is a characteristic feature of cystitis produced by cantharides. The exudation is not peculiar to any age or sex, and is most common in the neck or bas-fond of the organ, although no part is entirely exempt from it. Generally speaking, it is of a grayish or drab color, but now and then dark brown, greenish, or even reddish from an admixture of the coloring matter of the blood; while it varies in consistence from a thin solution of arrowroot to that of the buffy coat of the blood. The deposit, or infiltration, rarely presents itself as a distinct membrane, spread over the entire inner surface of the bladder; but, in most cases, it occurs in patches from half an inch to two inches in diameter; or it may present itself in the form of small dots; or as an amorphous mass of a dirty grayish color.

When flakes of aplastic lymph, or false membranes, are deposited in large quantities, they necessarily diminish the capacity of the bladder, and seriously embarrass its functions. Extending into the urethra, they may choke up that passage, and thus impede the flow of urine; and I have several times seen complete retention ensue from this cause. Prolonged upwards into the ureters, the deposit interferes with the excretion of urine, and leads to a fatal result from uremia. Fortunately, however, in

¹ Virchow's Archiv, Bd. vii. p. 30.

² Trans. Path. Soc. London, vol. xv. p. 141.

³ Ibid., vol. xiii. p. 150.

most cases, it is discharged almost as fast as it is formed, and thus the evil consequences alluded to are prevented.

There are no symptoms by which this form of inflammation is distinguishable from ordinary cystitis, save the presence of some of the exuded matter, loosened by the production of pus, in the urine, or at the orifice of the urethra. The treatment, in addition to the remedies employed for cystitis, consists in relieving the bladder with the catheter, and preventing reaccumulation by injections of a solution of nitrate of silver, in the proportion of from four to ten grains of the salt to the ounce of water. When there is reason to believe, from the nature of the case, that the bladder is nearly filled with the exudation, the proper proceeding is to open it above the pubes and turn out its contents. In this way, a cyst, of the shape and dimensions of the interior of the viscus, is said by Dr. Knox¹ to have been removed by Mr. Liston.

SECT. III.—SUPPURATION AND ABSCESS OF THE BLADDER.

A discharge of pus, or muco-purulent fluid, from the lining membrane of the bladder, although sufficiently common in connection with chronic cystitis, is infrequent as a consequence of the acute form of the disease. The discharge, moreover, is usually of brief continuance, and small in quantity, while in chronic cystitis it often lasts for a long time, and is occasionally astonishingly profuse.

The matter, instead of being secreted by the free surface of the mucous membrane, occasionally presents itself in the form of an abscess, situated in the submucous connective tissue, or between the muscular and serous tunics. Abscesses forming between the coats of the bladder cannot, from the nature of their situation, attain much volume, and we accordingly find that they are seldom larger than a pea, filbert, or a pigeon's egg. The exceptions in which they acquire the magnitude of a walnut, a billiard-ball, or an orange, are exceedingly rare. They may occur in any part of the viscus, but are most frequently observed at its neck; and it is seldom that there is more than one, though occasionally as many as five or six have been met with

¹ Medical Times and Gazette, Aug. 2, 1862, p. 104.

in the same individual. After having existed for an indefinite period, the abscess makes an attempt to evacuate its contents, by exciting ulcerative absorption of the parts by which it is covered.

In the great majority of instances, the abscess points inwards towards the cavity of the bladder, into which it finally escapes and passes off along with the urine. Such a termination is necessarily attended by a sloughy, ragged state of the mucous membrane, which may be so undermined by the ulcerative process, as to eventuate in perforation, with infiltration of pus into the surrounding tissues. It may also open into the rectum, the sigmoid flexure, the ileum, the vagina, or the belly, or through the abdominal walls above the pubes.

The matter, instead of being collected into an abscess, is sometimes diffused through the connective tissue of the coats of the bladder, which, in consequence, exhibit a soft cedematous aspect, and pit under pressure. Upon puncturing the affected part, at different points, the pent-up fluid escapes as from an anasarctous limb, especially if it be intermixed with serum, and the swelling proportionately subsides. This form of suppuration, of which interesting examples are recorded by Bonnetus,¹ Ruysch,² and other observers, may take place under the influence of calculous irritation, or as a consequence of external violence, which, in fact, is its most frequent cause. The occurrence is, of course, very rare.

Suppuration of the bladder may be the result of idiopathic inflammation, either acute or chronic, the extension of gonorrhœal inflammation, retention of urine from stricture or enlarged prostate, external violence, or the presence of some foreign body, as a calculus, a bougie, or a catheter. In the latter case, abscesses are generally produced under the influence of protracted irritation, operating directly upon the tunics of the organ. Occasionally there is reason to believe that they are developed in consequence of the irritation of some neighboring or associated viscus, as the ureter, kidney, prostate gland, or uterus. The purulent collections which are sometimes found between the coats of the bladder, after the operation of lithotomy, probably have their origin in phlebitis.

¹ Sepulch. Anat., t. xi. lib. 3, p. 590.

² Obs. Anat.-Chir., ob. 89, p. 82.

The occurrence of suppuration is denoted by frequent rigors, alternating with flushes of heat; by an increase of thirst, anxiety and restlessness; by nausea and vomiting; by the character of the pain, which is dull, aching, and throbbing; and by a feeling of weight in the perineum and anus. The mind generally wanders, and, in many cases, there is confirmed delirium. As the fever declines, the urine is secreted more abundantly, and exhibits a peculiar whitish appearance indicative of the presence of pus. In abscess, before the rupture of the inclosing cyst, no such evidence is discernible.

The diagnosis of suppurative cystitis is obscure, even the appearance of pus in the urine affording no conclusive evidence of its occurrence, as it may have been derived from the urethra, prostate, ureter, or kidney. The nature of the discharge can always be determined by the eye, aided, in cases of doubt, by the microscope and the guaiacum test of Dr. Day. Infiltration of pus into the coats of the bladder cannot be distinguished during life. In the case of abscess the thickened and rigid bladder is incapable of muscular movements. Hence, as it cannot expel its contents, there is retention; and as it cannot expand, the urine flowing into it must finally escape from the urethra drop by drop, with signs of violent tenesmus. If seated at the neck of the organ, it will obstruct the orifice of the urethra; or if it arise in the vicinity of the ureters, it will compress their openings and cause enormous dilatation of these ducts. Percussion and palpation of the hypogastrium, the rectum, and vagina, especially if the bladder be emptied of its urine, may lead to the detection of a tender, and possibly fluctuating, tumor, and presumptive evidence of the existence of an abscess is afforded by the sudden appearance in the urine of a large quantity of pus, after a violent effort at micturition, or an attempt to draw off that fluid. Even here, however, it should not be forgotten that the tumor may be a pericystic accumulation of pus, and that the matter may be derived from an abscess of the prostate, kidney, bowel, or uterus.

The prognosis of suppuration of the mucous membrane of the bladder is usually favorable, especially when it is an effect of the acute form of the disease. Suppuration, dependent upon chronic inflammation, often persists for a long time, obstinately resisting every method of treatment that can be brought to bear against

it. When produced by external violence, the discharge may be so copious as to bring on hectic fever, with all its train of evils. In calculous disease, the suppuration usually disappears promptly after the removal of the exciting cause.

In abscess the prognosis is, in general, not favorable. Recovery is more likely to take place when the disorder is the result of external violence than when it is the effect of some internal cause. In calculous patients, the prognosis is unfavorable, because abscess after abscess is liable to form, until the patient's strength is undermined by local and constitutional suffering, or his life is destroyed by total suppression of urine.

The treatment of suppurative inflammation of the bladder is to be conducted upon general antiphlogistic principles, in its early stages, and, subsequently, upon the tonic and invigorating plan, aided by mildly astringent injections. When hectic irritation is present, the best remedies are quinia and elixir of vitriol, in doses proportioned to the age and condition of the patient. The diet must be bland and nourishing; demulcent drinks must be freely used, to obtund the acrimony of the urine; and the bowels must be maintained in a soluble state, by Epsom salt or hot enemata. All local sources of irritation must be removed as early as possible; the catheter is used, if necessary, for the relief of retention; spasm of the bladder is allayed by anodyne suppositories, opiate injections, and fomentations to the perineum and hypogastrium; and sleep is procured by the internal exhibition of opium, the salts of morphia, or black drop. If abscesses point, they must be opened with the knife, or trocar, and free drainage afforded.

SECT. IV.—GANGRENE OF THE BLADDER.

Acute inflammation of the bladder sometimes terminates in gangrene, an occurrence which is particularly to be apprehended when the morbid action is marked by great violence, when it has been induced by external injury, and when it occurs in old, infirm, broken-down subjects, or in persons whose health has been much impaired by previous suffering. Sometimes it succeeds to an attack of acute inflammation engrafted upon a chronic one.

Although mortification may occur as a consequence of idiopathic inflammation, it is almost always the result of over-

distention from urine, of external violence, or of compression of the child's head in parturition. Excessive distention from protracted retention of urine is often followed by extensive gangrene, whether it be preceded by acute inflammation or not. The whole organ may be deprived of its vitality; but, in general, the gangrene occurs in small, circumscribed spots at the neck of the viscus. The affection occasionally follows the operation of lithotomy, and laceration of the mucous membrane consequent upon the employment of instruments. From this cause many patients have perished since the introduction of lithotripsy. It has also been observed by Cossy, in an epidemic form, in persons laboring under typhoid fever.

The period which intervenes between the development of cystitis and the occurrence of gangrene, varies in different cases and under different circumstances. In general, it does not exceed six or eight days; but it may be considerably shorter, and, on the other hand, it is sometimes delayed to the end of the second or the middle of the third week. In traumatic cases, gangrene often occurs at an early stage of the disease, and speedily destroys the patient.

The occurrence of mortification of the bladder is announced by great prostration of strength; sudden cessation of pain; coldness of the extremities; small, weak, and frequent pulse; profuse, clammy, and offensive perspiration; cadaverous expression of the countenance; mental confusion, delirium, and coma; hiccup; twitching of the tendons; and, towards the close, by colliquative diarrhœa, and involuntary discharge of the feces. The urine is of a brownish or blackish color, emits a peculiarly fetid or cadaverous odor, and is effectually retained by the dead, crippled, or paralyzed organ.

On dissection, the mucous membrane is found to be of a dark red, livid, or purple complexion, very soft, easily torn, and bathed with a thin, sanious fluid, of an excessively fetid odor. In some instances, the eschars are of a greenish, grayish, or drab color, and have a sort of depressed appearance, as if they were sunk beneath the natural level. The parts immediately around the seat of the gangrene are generally remarkably tumid and spongy, from the distention of the capillary vessels and the presence of effused fluids. The submucous connective substance at the affected part, as well as for some distance beyond, is infiltrated

with bloody matter, and yields under the slightest pressure; the muscular fibres are preternaturally dark and lacerable; and the peritoneal investment exhibits all the evidences of high inflammatory action, being more or less discolored, incrustated with lymph, and adherent to the neighboring parts. In cases where the disease does not speedily terminate life, the muscular coat is sometimes denuded over a large space, and the sloughs lie loose in the urinary reservoir, small fragments of them having perhaps been voided during life.

Gangrene of the bladder is sometimes followed by rupture of the coats of this organ, and the escape of its contents. This event is most likely to happen when there has been protracted retention of urine with inordinate distention, and may take place very suddenly, while the patient, perhaps, is turning about in bed, or during a fit of coughing or vomiting; or it may occur slowly and gradually, as a result of ulceration. In the latter case, the opening is generally small, and is often accompanied by an effusion of lymph upon the outer surface of the organ, or, what is the same thing, by an imperfect agglutination of the bladder to the neighboring parts. When the rupture occurs spontaneously, or under the influence of muscular exertion, it is always followed by an escape of urine, either into the cavity of the abdomen, or into the connective tissue of the pelvis. In either case, the ultimate consequences are the same. Violent peritonitis soon arises, attended by the most intense suffering, and terminating fatally in a very few days. The patient is instantly seized with the most agonizing pain, with an inability to move or turn about, and a sense of profound depression; symptoms which are always sufficiently characteristic of the true nature of the accident.

The prognosis of this disease is always unfavorable. Recovery, it is true, sometimes occurs even when the gangrene is apparently extensive, but such an event must always be regarded as an exceptional one. In general, the inflammation which precedes and accompanies the mortification, even when the latter is slight, is so severe, and causes such an amount of local and constitutional suffering, that few systems, however strong and robust, can withstand its deleterious effects. Aware of these facts, the practitioner cannot be too cautious in delivering his opinion as to the probable issue of any particular case.

The treatment of gangrene of the bladder is easily told. The object is to prevent the lesion rather than to cure it after it has been established. With this view, the practitioner must redouble his efforts the moment he sees that this event is threatened, and endeavor, by a judicious and well-directed course of treatment, to arrest the inflammatory action. Should gangrene be inevitable, the indication is to support the system, and by means of quinine, ammonia, brandy, opiates, and nutritious food, assist the patient in throwing off the effects of the local disorder. The distention of the bladder is obviated by the catheter. Should rupture take place, with infiltration of urine into the connective tissue of the pelvis, the perineum should be freely opened.

SECT. V.—ULCERATION OF THE BLADDER.

Judging from the results of my own observations, both at the bedside and in the dissecting-room, I am disposed to rank ulceration among the rarest terminations of acute cystitis. The ulcers, which are most common in the neck and bas-fond, are usually neither numerous nor large. In fact, it is rare, in any case, to find more than two or three, and these may be so small as to elude superficial inspection, particularly when the morbid process is confined to the mucous follicles. Sometimes, however, the number is much greater, and the size more considerable, the lining membrane exhibiting, in consequence, a ragged, riddled appearance. At other times again, but very infrequently, there is a single ulcer, so large as to occupy the greater portion of the organ, and denude the muscular fibres as thoroughly as if they had been dissected with the knife. Their most common appearance is that of cleanly punched holes, resting upon the submucous connective tissue, of circular or oval form, with slightly elevated edges. Not uncommonly they are exceedingly irregular in their outline, and their edges are hard and thick, fissured, puckered, or jagged. These peculiarities are most common in old, chronic cases. As the disease progresses, the erosion may extend through the submucous tissue to the muscular walls, which, in their turn, may be penetrated, and the serous covering be invaded, eventuating in perforation, followed by the escape of urine, and the development of fatal peritonitis; or by adhesion of the organ to

the sigmoid flexure of the colon, or one of the coils of the small intestine, which may be destroyed layer by layer, until a communication is established, through which there is a reciprocal passage of their contents. In the female, the ulcer sometimes opens into the uterus or the vagina; and, in both sexes, not infrequently into the rectum.

The most frequent cause of ulceration of the bladder is protracted chronic cystitis, arising from stricture of the urethra and enlargement of the prostate, although acute inflammation may terminate in this way. Paralysis of the bladder, injury of the spinal cord, and organic lesions of the kidneys, are very apt to induce it, from the changes which they effect in the composition of the urine. The presence of a calculus, or of the beak of a catheter permanently retained in the bladder, for drawing off the urine, as in paralysis of this organ, often occasions ulceration by the pressure which they exert upon the mucous membrane. It would appear, from the cases of it upon record, that the disease is more frequent in women than in men, and in old, decrepit, than in young, vigorous subjects.

The symptoms of ulcerated bladder do not differ essentially, in the early stage of the disease, from those of subacute or chronic inflammation. Even at a later period, they are not always distinct, or well marked. The most prominent local phenomena are, pain and uneasiness in the pelvic cavity, with spasm, frequent micturition, and an offensive state of the urine. The pain is of an acute, burning, or scalding character, and is aggravated by exercise, an overloaded state of the bowels, by pressure on the hypogastric region, the perineum, and the anus, by the finger in the rectum or vagina, and by the introduction of the catheter. It often darts along the course of the ureters to the loins, and is always most severe during the passage of the urine and for a few minutes after, when it disappears, but returns again as the secretion accumulates. In many cases, there is severe pain in the loins and kidneys, and in the groins and the upper part of the thighs. In the female, there is often a burning sensation at the orifice of the urethra; and in the male, the testicles are sometimes exquisitely tender, and there is great distress, with more or less itching, in the prepuce and the head of the penis.

The inclination to urinate is not incessant, but comes on in paroxysms, which gradually increase in frequency, and are

attended with intense suffering. The urine is expelled with much difficulty, or voided in drops, accompanied with an almost insupportable scalding of the urethra. Gradually, perhaps suddenly, the pain and distress subside, and the patient, exhausted by his exertions, sinks into a somnolent state, from which he is roused in fifteen or twenty minutes to pass through a similar ordeal.

The urine is generally acid and slightly albuminous, and deposits, on cooling, a considerable amount of thick, ropy mucus: sometimes it contains fine shreds of lymph, or the débris of the affected membrane. In the advanced stages of the complaint, it is excessively offensive, of a dark color, occasionally like coffee-grounds in appearance, and often mixed with pus, or tinged with blood. An ammoniacal state of this fluid is not uncommon at this period. Where there is extensive destruction of the lining membrane, little or no mucus is seen in the urine.

As the disease progresses, the sympathies and functions of the urinary organs are completely subverted, and the patient's health is materially impaired by the local derangement. In protracted cases, or where the destruction of the mucous membrane is extensive, pains are felt in the perineum and the rectum, only a few drops of urine can be retained at a time, the body is excessively emaciated, and the patient dies gradually exhausted by his suffering. Sometimes, however, on the other hand, the symptoms are comparatively mild, and but little distress is experienced in the urinary apparatus, from the commencement to the termination of the case.

The diagnosis of this malady is difficult, and cannot always be determined during life. The affections for which it is most liable to be mistaken are simple cystitis, catarrh, and stone. From the former it can generally be distinguished by its obstinate persistence, by the greater extent and violence of the local distress, by the incessant desire to void the urine, which is never suffered to accumulate, by the more frequent recurrence of spasms, by the more severe burning or scalding along the urethra, and, lastly, by the presence of pus in the urine, and, in the more aggravated forms of the complaint, by the absence of mucus. In catarrh, the characteristic symptom is a copious secretion of thick, tough, ropy mucus, with a turbid appearance and an ammoniacal odor of the urine. The local and constitu-

tional distress is less severe than in ulceration, the desire to micturate is not so frequent, there is less sensibility in the urethra, and there is often complete intermission of the vesical disturbance, the patient remaining comparatively comfortable for days and weeks. In ulceration, the symptoms are persistent, and the disease steadily proceeds from bad to worse. In stone, the pain is most severe immediately after micturition, and is generally much aggravated by rough exercise, the urine is also more frequently bloody, there is less irritability of the urethra, and the intervals between the paroxysms are longer than in ulceration. If doubt exist, the sound is used, cautiously and gently, lest, if the case be one of ulceration, it increase the local inflammation, and endanger life. In ulceration there is sometimes a discharge of the débris of the mucous membrane, which never happens in simple cystitis, catarrh, and calculous disorder. It should be carefully distinguished from the shreds of lymph which are occasionally voided in croupous inflammation.

When perforations exist, a discharge of gas, fecal matter, ingesta, and other substances, along with the urine, leaves no doubt respecting the nature of the disease. The gas occasionally passes by the urethra with an explosive noise, or in little bubbles mixed with urine. An escape of urine by the anus or vulva indicates that the ulcer has taken the direction of the rectum or vagina.

The prognosis of this disease is most unfavorable. That cures are occasionally effected, and that too without the aid of much treatment, is unquestionably true; but such a result must be regarded as extremely rare. Generally speaking, the ulcerative process proceeds in spite of the best directed efforts of the practitioner, gradually undermining the health, and exhausting the vital powers. The period at which death occurs varies from five or six months to several years.

In ulceration of the bladder there is nearly always more or less disease of the urethra, prostate gland, seminal vesicles, the ureters, and kidneys. All these organs are not necessarily involved at the same time, but not infrequently this is the case, and there are few instances in which several of them do not participate in the vesical affection. The most common lesion of the urethra is inflammation of its lining membrane, which is usually most conspicuous near the neck of the bladder, and is

sometimes marked by high vascularity. The prostate gland is usually enlarged, softened in its texture, and engorged with blood; occasionally its ducts are expanded, and its substance is pervaded by pus or sanious fluid. It is rare that this body suffers from an encroachment of the ulceration. The seminal vesicles seldom entirely escape the ravages of the malady. The most frequent morbid appearance of these reservoirs is high discoloration of their lining membrane, with softening of their texture, and an infiltrated and injected condition of the connective tissue by which they are connected to the bladder. Their contents usually exhibit the character of spoiled semen, which is sometimes of a very fetid odor. The ureters are variously affected; inflamed, ulcerated, dilated, contracted, thickened, or attenuated. One of the kidneys is sometimes natural, but, in general, both are implicated, though not in an equal degree. The lesion most commonly met with in these organs is inflammation, with ulceration of their substance, and a pretty copious secretion of pus. Another not infrequent effect is atrophy, and cases occur in which one of these glands is converted into a membranous pouch, totally devoid of parenchymatous tissue, and filled with sero-purulent fluid.

The bladder, in this disease, presents no uniformity in regard to its pathological appearances. Its capacity is normal, diminished, or increased; the muscular fibres are preternaturally distinct, and of a deep red color; the mucous membrane, when not completely destroyed, is sometimes covered with patches of lymph, and is nearly always remarkably thick, spongy, and vascular, immediately round the ulcers. Purulent matter, mixed with shreds of fibrin and the débris of the lining membrane, is generally found in the bottom of the bladder, and is derived either from this organ itself or from the ureters and the kidneys. The peritoneal investment, although usually healthy, is sometimes partially covered with lymph, and pretty firmly adherent to the neighboring parts. Occasionally the coats of the viscus are exceedingly soft, and incapable of resisting the slightest traction. In other cases, again, they are remarkably tough and indurated, owing, doubtless, to interstitial plastic deposits.

If perforations and adhesions form, in consequence of this disease, it is remarkable how long the patient may live with this loathsome infirmity. I am acquainted with a clergyman, now

eighty-five years old, from whose bladder fecal matter has been discharged for upwards of a quarter of a century. His health, with the exception of an occasional attack of colic, has been excellent. The passage of feces along this route occurred, at first, at long intervals, and rarely continued longer than three or four days at a time; of late, it has been much more frequent, and within the last twelve months, almost constant. When perforation takes place without adhesion, death generally supervenes, in from twenty-four to forty-eight hours, from inflammation of the peritoneum.

When the opening into the bowel is so large as to allow most of the urine to escape by that route, the patient will usually be affected with diarrhoea, excited by the contact of the irritating fluid. In this way, the intestinal disorder may be maintained for many months, perhaps, indeed, for years, without any suspicion on the part of the patient, and his physician, of its real nature.

From what has been said under the head of cystitis, the practitioner will have no difficulty in deducing the principles which ought to guide him in the management of ulceration of the bladder. At the commencement of the complaint, the means employed to arrest it must be strictly antiphlogistic, while subsequently they must be modified to meet individual contingencies, as they are developed under the eye of the practitioner. Active depletion by the lancet will seldom be called for after the expiration of the first week or ten days; while the local abstraction of blood by leeches is proper in every stage of the disorder, and constitutes one of our most valuable therapeutic resources. The best regions for applying them are the perineum, the parts around the anus, the upper and inner surface of the thighs, and the inferior portion of the abdomen, the number being proportioned to the exigencies of each particular case.

The bowels should be constantly kept in a soluble condition by mild aperients, the diet should be light, but nutritious, and the drinks, which should be taken in great moderation, so as not to increase unduly the renal secretion, should consist of plain water, linseed tea, or gum Arabic water. The patient should constantly wear flannel next the skin, and carefully guard against sudden vicissitudes of temperature. He should, moreover, keep himself as much as possible in the recumbent posture.

Sexual intercourse, and rough exercise of every description, must be carefully avoided.

Of the internal remedies calculated to act directly upon the urinary apparatus, the most important are buchu, uva ursi, and hops, which may be administered either in the form of infusion, decoction, or extract, alone, or variously combined with each other, or with copaiba, cubebs, hyoscyamus, cicuta, the alkalies, the mineral acids, or tincture of the chloride of iron. These articles are all beneficial in ulceration of the bladder, but experience has shown that none of them retain their good effects beyond a few days. It is important, therefore, that they should be frequently changed or varied, and not be continued too long at a time.

Whatever mode of treatment be employed, opium, laudanum, or morphia is indispensable for quieting the bladder and procuring sleep. The most eligible, or least objectionable form of administration is that of an enema, or a suppository; but it may also be given hypodermically, or by the mouth, although, in the latter way, it is more apt to produce constipation and derangement of the digestive function. In whatever manner it be exhibited, it should be employed in full doses, repeated at longer or shorter intervals, according to the exigencies of each individual case. Small doses, frequently repeated, only serve to render the system irritable without relieving the local suffering.

Local remedies, or means addressed directly to the affected surface, are sometimes highly serviceable, the best being such as are of an anodyne character, as infusion of poppy, opium, hops, aconite, and cicuta; the salts of morphia have also been recommended; and benefit has sometimes followed the use of warm water, either simple, or medicated with tar, tannic acid, sulphate of zinc, creasote, nitrate of silver, and other substances. Lime-water, black-wash, and a weak solution of iodine have occasionally proved advantageous. The amount of reliance to be placed upon these remedies may be readily inferred from their number and variety. Like the internal means, above alluded to, they soon lose their beneficial effects, and are sometimes positively injurious. Great caution, in fact, is always necessary in their employment. The best mode of introducing them is by means of a gum-elastic bag, carefully adapted to the end of a soft catheter. The quantity of any injection of this kind should

not, at first, exceed an ounce, or an ounce and a half; afterwards it may be gradually increased to three or even four ounces. An anodyne injection should be retained as long as possible; an astringent one, not more than a few minutes.

In females, in whom this affection is most common, the ulcerated surface may readily be brought into view, by means of Simon's speculum, shown in fig. 32, when it may be touched with nitrate of silver, dilute acid nitrate of mercury, an alcoholic solution of corrosive sublimate, carbolic acid, or sulphuret of carbon. When the disease proves obstinate, it is due to the constant and painful spasmodic contractions of the bladder, so that the best chance of relief is held out by placing the viscus at rest by an incision, which, commencing at the posterior fourth of the urethra, is carried through the median line of the vesico-vaginal septum, and terminates on a level with the orifices of the ureters. In this way, the late Sir James Y. Simpson cured two patients; and Bozeman, Emmet, Sims, Parvin, Simon, Hegar, and other surgeons, have been equally successful. In place of resorting to colpocystotomy, Dr. Hunter McGuire,¹ of Richmond, secured a free and constant escape of the urine, in a case of this nature of eight years' duration, by introducing a drainage tube into the bladder, where it was retained by bands passed around the hips. At the expiration of six weeks, the free end of the tube was attached to a gum bag, which was fastened to the thigh, and the patient was allowed to leave her bed and walk about. This course was persisted in for four months. For some days after the removal of the tube, there was incontinence, but the bladder soon regained its power; and eight months from the commencement of the treatment, the woman could retain her urine for three hours, and pass it without pain.

¹ Virginia Medical Monthly, 1874.

CHAPTER II.

CHRONIC INFLAMMATION OF THE BLADDER, AND ITS RESULTS.

SECT. I.—CATARRH OF THE BLADDER.

CATARRH of the bladder, technically denominated cystorrhœa, signifies an inordinate secretion of white, glairy muco-purulent fluid, dependent upon chronic inflammation of the lining membrane. It is analogous in its character to gleet, leucorrhœa, and other kindred affections, and is generally a symptom merely of a more serious disease. Of the various names that have been employed to designate it, the most appropriate and expressive is cystorrhœa.

This disease has usually been described by authors as consisting of two varieties, the acute and the chronic; an arrangement for which, I conceive, there is no necessity, since the former affection does not differ in any respect from suppurative cystitis, described in the preceding chapter. This distinction is of practical importance, and should not be lost sight of in the further consideration of the subject.

Catarrh of the bladder is almost peculiar to advanced age. I have never met with it before puberty, except as an attendant upon stone, and but very rarely, under any circumstances, before the forty-fifth or fiftieth year. Persons of a gouty or rheumatic habit are supposed to be particularly obnoxious to it; but of this I have witnessed no corroborative facts in my own practice. The disease is also said to be more common in winter than in summer, and in cold than in warm climates; and it is asserted that it may prevail epidemically. Finally, males are more liable to it than females, for the obvious reason that they are more subject to obstruction of the urinary passages, and to all kinds of exposure.

Cystorrhœa is always dependent, directly or indirectly, upon some obstacle to the evacuation of the urine, or upon a diseased condition of the bladder itself. Hence, the most common

exciting causes are stricture of the urethra, the presence of a vesical calculus, and enlargement of the prostate gland. In the female, it is not uncommon from partial retention of urine, induced by compression of the urethra against the pubic symphysis, or changes in the position of the urethra, in consequence of malpositions of the uterus, or conditions external to that organ, pressing upon or dragging down the bladder. Paralysis of the bladder, whether produced by overdistention of the organ by urine, or injury or disease of the spine, frequently gives rise to this state; and it is a constant attendant upon sacculation, ulceration, hypertrophy, and carcinoma of the bladder. In all these affections the bladder is never entirely emptied either voluntarily or by the catheter, but a portion of the urine remains behind, and is speedily decomposed, with the evolution of carbonate of ammonia, which, acting as a chemical irritant, is a powerful factor in the production of the disease. When it is once established, it is easily aggravated or reinduced by exposure to cold, exercise on horseback, sounding, venereal excesses, drastic purgatives, indulgence in ardent spirits, stimulating food, irritating injections, diuretics, and other remedies, as turpentine and cantharides, overdistention of the bladder, neuralgia, retrocession of gout, repulsion of cutaneous eruptions, local injury and disease of the adjoining parts, as the anus, rectum, vagina, and uterus.

Cystorrhœa generally comes on in a slow, gradual, and insidious manner; and hence there is frequently serious structural lesion before the true character of the malady is revealed, or even suspected. The obstruction to the evacuation of the urine upon which it commonly depends, absorbs for a time the patient's entire attention, and it is only by accident that he is at length apprised of the real condition of the bladder. The inflammation which accompanies the affection, and which is always the immediate cause of the cystorrhœa, is of a chronic character, and usually, in the first instance, of a very mild grade. It is for this reason that the term subacute has been sometimes applied to it.

The characteristic symptoms of the disease are hypersecretion of mucus and pus, an altered condition of the urine, frequent and difficult micturition, pain in the region of the affected organ, as well as in the adjoining parts, and more or less consti-

tutional derangement. In the incipient stages, and in the milder forms of the affection, the quantity of mucus secreted is generally small, not exceeding perhaps a few drachms in the twenty-four hours. At a more advanced period, the quantity is often considerable; and in some instances the discharge is truly enormous, as in the case of a patient, mentioned by Barthoz, who voided not less than fifteen pounds in thirty-six hours. This, however, is a rare exception. Very frequently the mucus amounts to one-third, and even one-half of the entire discharge. In the early period of the disease, it is so intimately blended with the urine that it does not become perceptible until the latter begins to cool. It then presents itself in the form of an opaque, grayish, or whitish cloud, fleecy in its appearance, and at first suspended in the fluid, but gradually subsiding to the bottom. Its consistence gradually augments as the urine cools. Not unfrequently it occurs in flakes, strings, or small lumps. In the confirmed stage of the affection, it is always thick, ropy, tenacious, and semitransparent, and separates from the urine during micturition, or immediately after. It always in such cases adheres with great firmness to the bottom of the receiver, and is often so glutinous that in pouring it from one vessel into another it draws itself out upwards of a foot in length without breaking.

The urine, in the early stage of the complaint, is nearly natural, both in its color, odor, consistence, and chemical properties. By degrees, however, it assumes a turbid, muddy aspect, becomes more or less offensive, and is thick, acrid, alkaline, and surcharged with triple phosphates, pus, and epithelium, as shown in fig. 1, from a drawing by Dr. Brewster, one of my former clinical assistants. During the progress of the disease, it always becomes highly acrid, so that the bladder can hardly tolerate it even for a few minutes. It generally emits a peculiar ammoniacal odor, is rapidly decomposed, both in the bladder and out of it, and is mixed with epithelium, urate of ammonia, purulent and phosphatic matter, and bacteria. If a silver catheter is used at this stage, it usually comes out of the bladder of a

Fig. 1.



Urinary Deposits in Cystorrhœa.

bronze, brownish, or black color, in consequence of the presence of a minute quantity of sulphuretted hydrogen.

The pus which is present in this disease is derived from various sources; sometimes from the bladder, sometimes from the ureters, or the prostate gland, but in general from the kidneys, one or both of which are often seriously involved in the mischief. Its presence is always to be regarded with great attention, as it is generally indicative of serious disease of the organs from which it is derived. It should be remembered that the glairy, tenacious deposit in this affection is in reality not simple mucus, although it resembles it. Through the decomposition of the urea of the stagnant urine, carbonate of ammonia is generated, which not only occasions the alkalescence and acridness of the fluid, but effects a change in the associated discharge of pus, to which the peculiar characteristics of the deposit are largely due.

The urine is voided frequently, in small quantity, and with more or less difficulty. Generally, it passes off in interrupted jets, in a small, feeble stream, or in drops, accompanied by violent spasm and straining. Great effort is often required to start it, and it rarely happens that the whole of it is evacuated at any one time. When the urine is loaded with thick, ropy deposit, the difficulty of voiding it is much increased, and the patient is frequently obliged to have recourse to the catheter.

The pain attending this affection is liable to much diversity. In general, it is of an obtuse, or a dull, heavy, aching character, and is situated above the pubes. In the more aggravated forms of the disease, it is scalding, burning, pricking or spasmodic, and accompanied with the most violent straining and tenesmus. It is usually most severe at the commencement of micturition, and gradually reappears as the bladder refills. It is liable to be aggravated by exposure to cold, venereal indulgence, rough exercise, the erect posture, pressure on the abdomen, drastic purgatives, and whatever has a tendency to augment the secretion of mucus.

Patients affected with cystorrhœa are sometimes impotent, even if they are comparatively young. I have met with several instances of this kind. In one remarkable case, the gentleman, forty-four years of age, had experienced no sexual desire for upwards of six years, though he was naturally of an amorous

disposition. His penis had become soft and flabby, and had not been in a state of complete erection for a long time. He had occasional emissions, but they were always unaccompanied with the proper feeling. Owing to the frequent micturition which forms so striking a feature of this disease, and the severe straining which generally attends it, catarrh of the bladder is often complicated with hemorrhoids, prolapse of the bowel, swelling of the testes, and even with hernia.

The prognosis in cystorrhœa varies with many circumstances which hardly admit of precise detail. Much will necessarily depend upon the age and constitution of the patient, the duration of the disease, and the condition of the bladder and of the associated organs. In its incipient stage, it is sometimes not difficult to cure; but when, commencing gradually, it has at length come to disorder the whole system, it rarely terminates favorably, and must be ranked among the most rebellious of maladies. It not unfrequently remains stationary for a time, or even almost entirely disappears, and then recurs, perhaps with increased violence, merely from the slightest irregularity in diet, drinking a glass of wine, exposure to cold, fatigue, or venereal indulgence. The prognosis is always more unfavorable in old than in young subjects, in protracted than in recent cases, and in the simple than in the complicated forms of the disease. When the kidneys, ureters, prostate gland, or urethra are much involved, the complaint generally proves fatal under the best management, the patient being gradually worn out by local suffering and constitutional irritation.

The morbid alterations observed in those who die of this disease are various. In the early stage, and in the milder forms, the mucous membrane is in a state of passive hyperemia, and the subepithelial connective tissue is tumid and infiltrated with cells. Later in the disease, ulceration is not uncommon; and hypertrophy of the bladder is almost invariably present. Sacculation of the viscus is not infrequent, and the kidneys, ureters, and prostate are generally implicated. Now and then, as was first noticed by Rokitsky, there is an excessive growth of tessellated epithelium on the surface of the mucous membrane, which leads to the formation of thickly-laminated, whitish, glistening layers of epithelial cells, which become detached in large scales. These cells may undergo fatty degeneration, and

give rise to a singular condition which was observed by Lowenson,¹ in a female, forty years of age. The bladder was enormously dilated, and filled with three and three-quarters of a pound of small yellow globules and glistening scales lying free in the interstices, the whole looking like pea-soup, with the husks retained. The inner surface of the viscus was covered with firm, elastic, laminated flakes of dull mother-of-pearl brilliancy. The concretions were formed by the contractions of the bladder detaching fragments of the fissured deposit, which underwent fatty metamorphosis, their globular shape being imparted to them by mutual friction and attrition. Epithelial hyperplasia, with epidermoid transformation, is only seen as the result of frequent relapses of chronic inflammation.

In the treatment of this affection, the leading indications are, to remove the exciting cause, to allay morbid action, to prevent the decomposition of the urine, and to keep the bladder clean. If there be a stricture of the urethra, stone, or foreign body in the bladder, hypertrophy of the prostate gland, or disease of the neighboring and associated organs, neither topical nor general remedies can be of the least avail, unless these affections are removed. A thorough preliminary examination should always be made of the urethra, the prostate, the interior of the bladder, the rectum, the vagina, the uterus and its appendages, and the pelvic cavity.

Antiphlogistics are required in all cases attended with violent pain, frequent micturition, and constitutional disturbance. Twenty to thirty foreign leeches may be applied to the perineum and inside of the thigh, or to the lower part of the hypogastrium; and the topical bleeding should be followed up by the warm bath, warm fomentations, and warm enemata. The bowels must be opened with saline cathartics; or, when the secretions are much deranged, with blue mass and podophyllin, with the addition of one grain of ipecacuanha, all articles tending to irritate the rectum being avoided. Strict recumbency must be enjoined; the diet should be light; and demulcent drinks, as gum-Arabic, or slippery-elm, water, or flaxseed tea, should be freely used.

When, by these means, the violence of the disease has been

¹ Peters. Med. Zeitschr., 2, 1862, p. 225.

subdued, I know of no remedy so well calculated, in ordinary cases, to ameliorate the morbid condition of the bladder as the balsam of copaiba. To be effectual, it should be given in doses not exceeding ten, fifteen, or twenty drops, three or four times in the twenty-four hours. The best form is that of emulsion, prepared with gum Arabic, loaf-sugar, and oil of gaultheria. Its nauseating, griping, and purging tendencies should be counteracted by combining with each dose a few drops of laudanum, or a small quantity of morphia. When it does not disagree with the stomach, or produce other mischief, its employment may often be advantageously persisted in for several successive weeks. When the patient is troubled with pyrosis, or acid eructations, the medicine may be advantageously conjoined with bicarbonate of soda.

The terebinthinate preparations are sometimes highly beneficial in this affection. They should be used in small doses, largely diluted with gum-water. The Chian turpentine is, on the whole, the best of this class of remedies, exhibited in the form of pills, with extract of henbane, cicuta, or colchicum.

From buchu and pareira brava, which have been so much extolled in the treatment of catarrh of the bladder, I have never derived much benefit. An article which has a specific tendency to the urinary organs, and which I have found particularly serviceable in cases attended with excessive morbid sensibility of the neck of the bladder, is uva ursi. It may advantageously be conjoined with hops or lupuline, and, in the class of cases just mentioned, with bicarbonate of soda. The combination, which I am in the habit of using, consists of one ounce and a half of the leaves of the uva ursi, and half an ounce of hops, or one drachm of lupuline, infused in a quart of water in a covered vessel for two hours. To the strained liquor are added two drachms of bicarbonate of soda, and two grains of morphia, if there be much pain. Of this a wineglassful is to be taken five or six times a day.

The *epigrea repens*, commonly called the trailing arbutus, ground-laurel, or May-flower, may occasionally prove useful in this malady. It possesses moderately diuretic, as well as slightly astringent, properties, and is closely allied, in its effects upon the urinary organs, to uva ursi. The best form of exhibition is a strong decoction, prepared with one ounce of the dried leaves to

a pint of water, of which a large wineglassful may be taken every two or three hours. Sir Henry Thompson speaks highly of triticum repens, or couch grass, in this affection. Two ounces of the cut and dried underground stem are boiled in one pint of water for fifteen minutes. The strained infusion is given in doses of a gill four times during the twenty-four hours.

A combination of some of the articles above mentioned may often be advantageously employed. Indeed, the effect is usually much more conspicuous, when they are given in this manner, than when they are used separately. I have long been in the habit of administering, with the happiest effect, a combination of buchu, uva ursi, and cubebs, sometimes in the form of infusion, but more generally in that of tincture, given several times a day in conjunction with a small quantity of bicarbonate of soda. Occasionally, a few drops of balsam of copaiba, tincture of the chloride of iron, or dilute nitric acid, may be advantageously added to each dose of these medicines. When thus combined, it is of course impossible to determine what merit is due to each respective article. The tincture of the chloride of iron, given by itself, sometimes answers an excellent purpose. It is a valuable tonic, and evidently exerts a direct influence upon the urinary organs. Its use is particularly indicated in cases attended with atony of the bladder, a want of appetite, loss of strength, and great pallor of the countenance. When the disease is associated with a gouty or rheumatic state of the system, colchicum should be employed, and the best form of exhibiting it is in combination with an anodyne. My usual practice is to give one drachm of the vinous tincture with fifty drops of laudanum, or half a grain of morphia, every night at bedtime, followed every other morning by a small quantity of Epsom salt and calcined magnesia, to clear out the bowels gently. In some instances, the acetic extract, in the dose of two grains, forms a valuable substitute.

Benzoic acid is sometimes used in this disease, and occasionally answers when everything else has failed. I have repeatedly employed it with excellent effects, and can speak positively as to its value in the treatment of cystorrhœa. It may be given by itself, or what I prefer, in union with balsam of copaiba. It occasionally acts like a charm. Its value arises from the fact that it neutralizes the carbonate of ammonia of the decomposed

urine, forming a soluble hippurate of ammonia, which prevents the deposition of triple phosphates. The dose is fifteen grains daily, gradually increased to one drachm, in the form of pills, or suspended in mucilage of gum Arabic. By the employment of this remedy, the acid reaction of the urine is restored in a week or ten days.

To allay pain and induce sleep, anodynes are indispensable in almost every stage of this disease. They should be given in full doses by the mouth, by the rectum, or hypodermically. An injection, composed of from one to two drachms of tincture of opium and two ounces of starch water, often powerfully contributes to allay the pain and spasm of the bladder. An anodyne suppository not unfrequently answers the purpose much better than an enema. It exerts the same calming influence, and possesses the additional advantage that it does not stimulate the rectum to throw off its contents. An excellent suppository consists of two grains of opium, and five grains of camphor, with half a grain of extract of belladonna, rubbed up with cacao butter. When a diaphoretic effect is desired along with the anodyne, the most efficient remedies that can be employed are Dover's powder, or morphia with tartar emetic.

Counter-irritation, in the form of an issue, with the hot iron, tartar emetic pustulation, or strong tincture of iodine, applied to the hypogastrium and the perineum, is sometimes useful, particularly in obstinate cases. An emollient poultice sprinkled with mustard, or flannel cloths wrung out of hot water and laudanum, laid over the pubes, are often productive of temporary benefit.

The last and one of the most important indications in the treatment of cystorrhœa, is fulfilled by emptying the bladder of its residual acrid and irritating urine with the catheter, and freeing its lining membrane from viscid and earthy deposits by thoroughly washing out its interior, twice daily, with water at a temperature of 98° or 100°. Caution must be observed in resorting to these measures as long as the viscus resents the introduction of instruments, lest greater injury be inflicted, and a remedy, otherwise calculated to be beneficial, be brought into disrepute. Under these circumstances, however, pain from instrumental contact may be avoided by using a gum elastic catheter provided with an opening at its extremity instead of on

its side. This should be withdrawn, as the last drops of urine are passing off, so that it may rest merely at the vesical orifice of the urethra, when about an ounce of water is thrown in by an India-rubber bag, with a stopcock and tapering nozzle, the latter of which is inserted into the catheter. By entering the instrument a little way, the dirty fluid readily escapes; and the operation is repeated five or six times, or until the water comes away nearly clear. Instead of this simple apparatus, the self-injecting device of Dr. E. L. Keyes, of New York, shown in fig. 2. will be found to answer an admirable purpose. Should

Fig 2.



Keyes's Apparatus for Washing out the Bladder.

the prostatic urethra be sensitive, the catheter need only be passed through the opening in the triangular ligament. Indeed, the bladder may be injected by inserting an instrument only an inch or two in the canal. For this purpose Professor Zeissl,¹ of Vienna, after having placed the patient recumbent, with the pelvis elevated, grasps the penis with the left hand, putting it

¹ Prager Vierteljahrschrift, Bd. li., 1875, p. 62.

on the stretch, and carrying it at the same time towards the abdomen, while, with the right hand, he inserts a gum-elastic tube into the meatus, the other end of which is attached to a bag filled with fluid, and elevated several feet above the level of the patient's body.

In whatever way the injection be practised, the utmost care and gentleness must be observed ; and air must not be permitted to enter the bladder, as it would produce severe pain. When the urine is highly alkaline and fetid, the water may be impregnated with chloral hydrate, permanganate of potassa, or carbolic acid ; and with a view of making a direct impression on the inflamed surface, when it resists simple treatment, astringent, sedative, and alterant agents may advantageously be used. Of these the most important are acetate of lead, sulphate of zinc, nitrate of silver, borax, morphia, and nitric acid. Of the first three articles the proper proportion, to begin with, is about one-fourth of a grain to the ounce ; of borax fifteen grains ; of morphia one grain ; and of nitric acid two drops. The latter agent and the metallic salts are most useful when the urine is depositing phosphates. The article which, on the whole, I have myself found most efficacious is nitrate of silver in union with one drachm of laudanum. The fluid should be retained until it causes uneasy sensations, or a feeling of distention, when it should be removed. I have never employed strong injections of this salt, as from twenty to thirty grains to the ounce of water, having always been afraid of the results of such heroic doses. In very troublesome cases, Dr. Mac Donnell, of Montreal, with whom the practice appears to have originated, derived great benefit from nitrate of silver, in the proportion of four grains to the ounce, repeated once a week ; and Dr. J. Braxton Hicks,¹ of Guy's Hospital, has quite recently recommended a solution of from five to fifteen grains, following it up with a permanent injection of two grains of morphia to the ounce of water.

Cauterization with the solid nitrate of silver has been resorted to especially by Civiale and other French surgeons. I have made a trial of the remedy in a few instances ; but do not think it made any decided impression upon the disease. It is chiefly

¹ British Med. Journ., vol. ii., 1874, p. 30.

applicable to those cases in which the catarrh is dependent upon inflammation of the neck of the bladder, accompanied with an unusual degree of morbid sensibility. The operation, which should be repeated once every sixth or seventh day, is best performed with a common porte-caustique, the cup of which is rapidly passed over the affected surface, and then withdrawn.

In obstinate and intractable cases of cystorrhœa, where all other remedies have failed to afford relief, it has been proposed to open the neck of the bladder by means of an incision, similar to that made in the lateral operation of lithotomy, or by colpocystomy in the female, as previously described in the section on ulceration of the bladder. The object is to afford a free outlet to the altered secretion as fast as it takes place, and thereby put the organ into a state of comparative repose. This procedure, which was originally suggested by Mr. Guthrie, of London, was first carried into effect, in 1850, by Dr. Willard Parker, of New York, and has been resorted to, in the last decade, by Dr. E. Powell, of Chicago, Dr. Robert Battey, of Georgia, and Dr. Gouley, of New York. In the case of Dr. Battey life was prolonged in a state of comparative comfort for eighteen months. The patient of Dr. Gouley was well and stout three years after the operation, with a permanent fistule, for which he wore a urinal. The practice certainly deserves imitation; and is particularly applicable to that form of cystorrhœa in which there is marked hypertrophy of the prostate, or in which there is concentric hypertrophy with diminished capacity of the bladder.

Finally, in the management of this affection the utmost attention must be paid to the diet, which should be of a farinaceous character, perfectly simple, and unirritant. During the existence of a paroxysm of the disease, nothing but arrowroot, tapioca, sago, rice, or gruel, should be allowed, and that only in small quantity. As the symptoms disappear, or when convalescence is fairly established, animal broths, fresh fish, oysters, and a little of the lighter kinds of meat, may be used. But neither at this nor at any previous period are condiments, as mustard and pepper, admissible. Even salt should be employed most sparingly. The slightest indiscretion in eating will be almost certain to be followed by an aggravation of the complaint, or a return of all the former symptoms. Vegetable acids, subacid

fruits, wine, spirits, and fermented liquors are prejudicial, and must be abstained from. The best drink is cold water, either simple or rendered mucilaginous with gum Arabic, elm bark, or flaxseed. When there is decided debility, the mineral acids, quinine, iron, and the bitter infusions, are indicated.

Exposure to cold must be carefully guarded against. Flannel must be worn next the skin, both summer and winter; riding on horseback is to be interdicted; sexual intercourse is to be abstained from; and the bladder must, for a long time, be emptied daily at stated intervals. A residence in a warm climate sometimes exerts a happy influence. Several of my patients have derived signal benefit from spending their winters in New Orleans, Cuba, Florida, and Texas.

When the kidneys, ureters, or prostate gland are seriously affected, no remedy, external or internal, local or constitutional, seems to have the power of checking this distressing malady. Life gradually ebbs away, and the patient dies completely exhausted. All we can advise, under such circumstances, is perfect tranquillity, a light but generous diet, anodynes by the mouth and the rectum, the warm bath, and attention to the bowels. Occasionally an accidental hemorrhage occurs, and procures a temporary suspension of the suffering.

SECT. II.—HYPERTROPHY OF THE BLADDER.

Of the various morbid alterations associated with chronic inflammation of the bladder, especially when it is dependent upon stricture of the urethra, enlargement of the prostate, calculus, and neoplasms, by far the most frequent is general and unmixed hypertrophy of its walls, as shown in fig. 3, from a specimen in my collection. Although it may be seated in any of the tunics, the hypertrophy is most common in the muscular, converting it into a homogeneous, grayish-red fleshy mass, which sometimes acquires the thickness of half an inch, or even one inch, in consequence of the powerful and frequent efforts it is obliged to make to overcome the mechanical obstruction to the egress of the urine, whereby its nutrition is greatly increased. The lesion is often partial, or limited to the internal fibres of the detrusor muscle, which are collected into large, rounded, projecting fasciculi, and resemble the fleshy columns of the ventricles

Fig. 3.



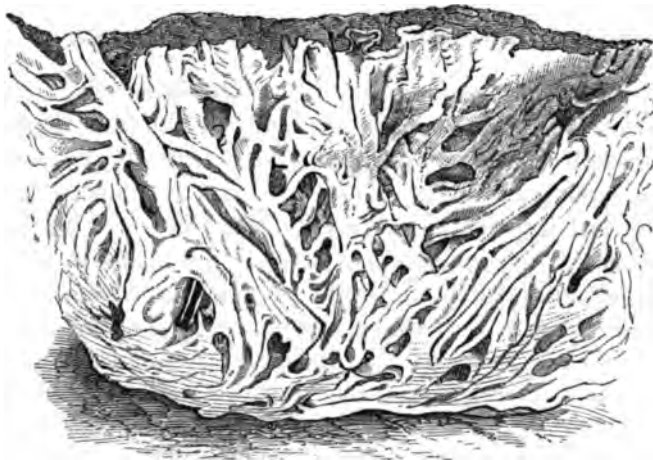
General Hypertrophy of the Bladder.

of the heart, thereby constituting the condition known as the columniform bladder, and giving rise to the peculiar retiform arrangement which is so well exhibited in fig. 4, from a preparation in my private cabinet.

The capacity of the viscus, in the majority of cases, is somewhat increased, in consequence of the accumulation of its contents, and partial loss of power to expel them. When the trouble arises from obstruction to the free passage of the urine from enlargement of the prostate in aged persons, enormous

dilatation is sometimes conjoined with hypertrophy of the muscular fibres, which are in a more or less advanced state of fatty degeneration, the bladder rising high up into the cavity of the abdomen, and containing many pints of urine. I have

Fig. 4.



Columniform Bladder.

in my possession several beautiful illustrations of this condition. Eccentric hypertrophy may even be congenital, and the dilatation

be so great as to be a cause of obstructed labor. In a remarkable case of this nature, reported by M. Dépaul, in which a six months' fœtus had to be removed by embryotomy, the bladder filled nearly the entire belly, and measured fourteen inches in its largest circumference; the immediate cause of the trouble having been obliteration of a portion of the canal of the urethra. It is interesting to note, in connection with this case, that the hypertrophy of the muscular walls denotes that the fœtal bladder does not merely play a passive rôle, but endeavors to expel its contents. In an opposite class of cases, particularly where there has been great irritability and spasm, as from the presence of a stone, or an irritable stricture of the urethra, the cavity of the bladder is much contracted, giving rise to concentric hypertrophy, and as a natural result, if the barrier to the escape of the urine be great, to the accumulation of that fluid in the ureters and the kidneys, which accordingly become enormously enlarged.

Hypertrophy of the bladder is essentially a disease of adults, and, for obvious reasons, is far more common in men than in women. It is, however, not infrequent in young children suffering from phimosis, and presenting all the symptoms of calculus, and I have met with several instances, in impubic subjects, in which the projecting fibres were covered with phosphatic deposit. The affection may exist at an early age without any obstruction whatever, in consequence of unhealthy, but too frequent and forcible, action, the symptoms being those of excessive vesical irritability. Examples of this nature are recorded by Sir James Paget.¹

It is a familiar fact that hypertrophy of the bladder in adults may arise from the want of consentaneous action between the detrusor muscle of the bladder, and the compressor muscle of the urethra. In the event of the failure of the latter to relax when the former contracts, the organ must of necessity be subjected to more frequent, violent, and irregular exertions to void its contents, through which its muscular walls finally become hypertrophied. In this way a species of retention of urine is brought about, giving rise to what Sir James Paget² terms

¹ Lectures on Surgical Pathology, 3d ed., pp. 56 and 57.

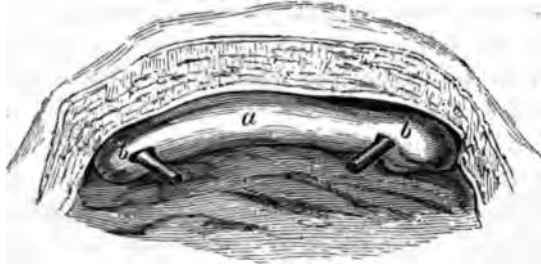
² Clinical Lectures and Essays, 1875, p. 77.

stammering bladder, an example of which, from defective volition, is narrated in the chapter on Retention of Urine. I am acquainted with a young gentleman in whom an attack of stammering is induced by the whistling of a person detecting him in the act of urination.

When the hypertrophy is seated in the lining membrane, or in the subjacent fibrous tissue, there is generally an excessive development of the mucous follicles, which are rendered extremely prominent, and pour out an unusual amount of thick, ropy fluid. In some instances callosities, due to hyperplastic formation of young connective tissue, are met with.

The mucous membrane, or this structure and the subjacent fibrous and superficial muscular textures, is sometimes elevated into one or more transverse ridges or bars, of which there are several distinct varieties. In a preparation in the cabinet of Dr. Sabine, from which the annexed drawing, fig. 5, was taken,

Fig. 5.



Interureteral Bar.

there are two ridges, of which the anterior and larger, *a*, overhangs the trigone, and corresponds to the interureteral ligament, of which it is merely an exaggerated condition. The ureters themselves, *b, b*, open on the front of the bar, about one-third of an inch from its rounded extremities. The walls of the bladder are upwards of half an inch in thickness, and the prostate is more than three times its natural size. The middle lobe of the gland is greatly enlarged, and consists of three distinct masses, separated by deep grooves; they are rounded off behind, where they are in contact with the main ridge of the bladder, while they are quite slender and narrow in front. Almost precisely similar appearances are exhibited in fig. 3. The presence of such a

ridge naturally tends to dam up the urine in the *bas-fond* of the bladder, and to keep up a constant state of chronic inflammation. It may also give rise to trouble in finding a calculus, after lithotomy, as in an interesting case reported by Mr. Bickersteth.¹

Another and entirely distinct variety of the affection was first accurately described by Mr. Guthrie,² under the name of the bar at the neck of the bladder. The affection includes two opposite conditions; the first, and by far the more uncommon, being a crescentic, valvular fold, or transverse ridge, at the neck of the reservoir, due to hypertrophy of the mucous membrane and muscular fibres which constitute the uvula, and entirely independent of prostatic enlargement; while the second is due to a barrier formed by a fold of the lining membrane, perhaps including some fibrous and muscular elements, lifted upward by the enlarged lateral lobes of the gland. In another class of cases, the bar is dependent upon hypertrophy of the median portion of the prostate.

The simple form of this variety of hypertrophy is occasionally observed in comparatively early life; while the prostatic form occurs in old men who have labored for a long time under vesical irritation. The former is produced by inflammation of the neck of the bladder from gonorrhœa, or other excitants of chronic spasmodic action which terminate in contraction and hypertrophy of the muscular fibres in this situation. Viewed, then, in reference to its causation, it may be the result of any affection attended with obstruction to the evacuation of the urine, and the habitual retention of this fluid in the bladder. Hence the most common exciting causes are such as produce general hypertrophy of the organ.

The symptoms of hypertrophy of the bladder are, in all respects, similar to those which indicate mechanical obstruction to the flow of urine and chronic cystitis. In the bar-like variety of the affection, the patient is also harassed with pain, particularly severe at the neck of the viscus, and excessive straining and tenesmus, accompanied by a scalding or burning sensation of the urethra, at every attempt at micturition. There are, however,

¹ Liverpool Medical and Surgical Reports, vol. i, 1867.

² Diseases of the Bladder and Urethra, 1834.

unfortunately no reliable signs of this lesion. In all cases, a careful exploration with the finger and sound should be instituted, as most likely to clear up the obscurities environing the diagnosis. A sound, with a short beak, will readily pass as far as the vesical orifice of the bladder, where, meeting with the bar, it will be partially or even completely arrested, or have to be lifted over it. The beak of the instrument being in contact with the barrier, if the finger be introduced into the rectum, and carried as high up as possible, its point may touch the posterior surface of the bar, which being, in this way, included between the finger and the sound, a good idea of its form and dimensions may be arrived at. If the sound is now passed onwards into the bladder, and its beak turned downwards, attempts at its removal will be futile, as it will hook against the ridge in that position.

The treatment of general hypertrophy of the bladder need not be dwelt upon, as it consists essentially in the removal of its exciting cause, the regular use of the catheter, and washing out the bladder at stated intervals. In the bar-like form of the affection, the catheter may be permitted to remain permanently in the bladder, as its pressure may exert a sorbefacient effect, and aid in reducing the volume of the bar. Cauterization of the part with the author's instrument will generally allay the heat and burning pain, and exert a direct and controlling influence over the concomitant morbid action of the mucous membrane in the immediate vicinity of the bar. The operation is performed with great gentleness, yet efficiently, and in such a manner as to bring the nitrate of silver in contact with a surface at least from one to two inches in diameter. The local irritation and distress are temporarily increased, but they subside in a few hours, and never fail to be followed by marked relief, although frequently not until the patient has taken a full anodyne. The cauterization is repeated every sixth or eighth day, and in the interval the patient is subjected to the treatment prescribed for chronic cystitis.

Division of the bar, as originally practised by Mr. Guthrie, and extensively adopted by the French surgeons, may be resorted to when more simple measures fail to afford relief. The operation is most conveniently performed by the instrument of Mr. Mercier, depicted in fig. 6. It consists of a silver canula, con-

taining a blade, which, by means of the circular handle, is made to cut from before backwards, or from behind forwards, the extent to which the blade is made to project being regulated by the screw attached to the canula.

When the bar is thick and rounded, excision of a portion may be practised, as recommended by Mercier, the beak of whose instrument for this purpose is shown in fig. 7. A portion of the barrier having been seized by the blades of the beak, turned downwards, it is fixed by means of the arrow-headed needle, when the blades are closed, and the excised piece removed when the instrument is withdrawn. Troublesome hemorrhage is liable to follow the operation, but it is rarely a cause of death. The subsequent treatment consists in the introduction of a soft catheter,

Fig. 6.



Fig. 7.



Mercier's Instrument for Excising a portion of the Bar at the Neck of the Bladder.

Mercier's Instrument for Incising the Bar at the Neck of the Bladder.

commencing on the sixth day; and four or five days later, passing a steel stylet into the catheter in order to make pressure upon the wound and prevent its closure.

When there is no other prospect of relief, Mr. Guthrie thinks we should afford the patient the benefit of an operation, similar to that which is practised for the removal of stone. To such

a procedure I can see no possible objection; the parts must be relieved, or death will be inevitable. The operation itself does not involve any special danger, the bleeding which attends it will remove vascular engorgement, and the muscular fibres of the bladder will be placed in a quiescent condition, highly favorable to the subsidence of chronic irritation. The urine and mucus will flow off involuntarily, and, unless the wound be permitted to heal too soon, a new and more healthy action will be almost sure to follow. I should myself certainly prefer this procedure to that of excision of a portion of the bar.

SECT. III.—SACCUATION OF THE BLADDER.

Sacculation of the bladder, an affection which has also been denominated hernia of the mucous membrane, internal cystocele, encysted, and diverticulated bladder, is a protrusion of the lining membrane through an abnormal opening in the muscular tissue,

Fig. 8.



Section of the Bladder and Prostate. *a*. Mucous surface of the bladder. *b, b*. Lateral lobes of the prostate. *c*. Middle lobe. *d*. Large cyst or pouch, partially laid open, and communicating with the bladder by a small orifice. From a preparation in my private collection.

and the consequent development of a pouch, bag, or sac, which communicates with the interior of the viscus.

The affection is much more frequent than is generally supposed. I have repeatedly met with it in my own dissections,

and there is hardly a practitioner of much experience who does not occasionally see a case of it.

These pouches vary much in number, size, and form, as well as in their structure, and the character of their contents. Sometimes there is only one; and should this be of large size, it may give the organ the appearance of being double, as is well shown in fig. 9, from a drawing made by Dr. Gould, of a remarkable

Fig. 9.



Sacculated Bladder. a. The bladder. b. The sac.

specimen contained in the Anatomical Museum of the Boston Society for Medical Improvement. The supplementary cavity, which occupied the posterior portion of the organ, was capable of holding from one to two quarts of fluid, and communicated with the bladder by an oval aperture, one inch and a half in length.

The greatest number I have seen was six. Generally there are not more than two, three, or four. In a case described by Houstel¹ there were not less than thirty-eight, all of them very small, and situated chiefly at the lower and back part of the bladder. In their volume, they range between a pea and an ordinary fist. Usually, however, they do not exceed that of a pigeon's egg, or a small marble. In an instance reported in 1862, by Professor Greene,² of Maine, a sac of this kind formed

¹ *Mémoires de l'Académie de Chirurgie*, t. i. p. 195, 1819.

² *American Medical Times*, New York, March 29, 1862, p. 177.

an immense tumor containing almost a gallon of limpid urine, and seriously encroaching upon the abdominal viscera. It was composed of a prolongation of the mucous and muscular tissues of the bladder, and communicated with that organ on the left side, four inches from its neck, by an opening eighteen lines in diameter, with well-defined, smooth edges. The bladder itself was greatly hypertrophied, its inner surface exhibiting a columniform appearance. The prostate was about the size of a common orange. The patient was eighty-four years of age, for the last six of which he had been harassed with dysuria.

In their shape these sacculi are globular, ovoid, pyriform, or conical. At an early period they generally have thin, transparent walls, formed exclusively by the mucous and peritoneal tunics; but as they increase in age, they are liable to become thickened, dense, and opaque, from interstitial or adventitious deposits. It is seldom that any muscular fibres enter into their structure. Sometimes, although rarely, they are double, or divided into several compartments by imperfect septa. The opening of communication between the cyst and the bladder is usually round, smooth, polished, and not larger than a goose-quill. Occasionally, however, it is extremely irregular, and so capacious as to admit a finger, or a pullet's egg.

These sacs are usually occupied by urine, which, from its protracted sojourn in them, is liable to become decomposed, and to give rise to inflammation, followed by a deposit of mucus, and even purulent matter. When they are very large, it is rarely that they are completely emptied at any one time, and hence the same evil consequences that result from partial retention of urine from paralysis of the bladder, or obstruction of the urethra. It is well known that calculous concretions not infrequently find their way into these abnormal pouches; and in some instances it is not improbable that they are developed in them.

There is no part of the bladder that is entirely exempt from this morbid change. Most frequently, however, it is observed at its sides and summit; for the reason apparently that there is less pressure here than in front and behind, and consequently more room for the protrusion of the lining membrane. When the cysts are numerous, they occupy different portions of the organ, although sometimes they are limited to a particular situation.

Sacculation of the bladder is always associated with, and, in fact, directly dependent upon, some mechanical obstruction to the ready egress of the urine. The most common causes are stricture of the urethra, enlargement of the prostate gland, and calculous concretions. Hence the affection is much more frequent in men than in women, in whom there is rarely much permanent impediment of any kind to the emission of the urine. Old age is the period of life most prone to it. I have never seen an instance of it in a young subject, though it may doubtless occur at an early period, especially when it is produced by the presence of a calculus.

The mode of origin of these pouches is sufficiently well understood. The first step in their formation is the existence of a mechanical obstruction at the neck of the bladder, or in the urethra, attended with more or less difficulty in voiding the urine. As the obstacle advances, the desire to make water becomes more frequent, and the exertion required to empty the bladder also increases. To surmount the impediment, the muscular coat of the organ is obliged, every few hours, to use the most powerful contraction, in consequence of which its fibres, naturally more closely grouped together at some points than at others, gradually separate from each other, forming a sort of network, the meshes of which vary, in the first instance, from the size of a millet-seed to that of a pea. The resistance of the muscular tunic being thus removed in certain situations, the mucous membrane, pressed upon on every side by the distended bladder, readily enters the crevices, just alluded to, and, by a continuance of the exciting cause, gradually bulges out beyond the level of the peritoneal surface. The process by which these changes are accomplished is slow, and the probability is that many years elapse before the resulting pouches acquire their ultimate limits. Once formed, their tendency is to augment with every increase of the local obstacle upon the presence of which their development depends.

There are no special symptoms which can be regarded as diagnostic of sacculated bladder. The only one upon which the slightest reliance can be placed, in this respect, is the existence of a tumor in the hypogastric region. When this is circumscribed, movable, elastic, and fluctuating, and especially when it is only partially emptied at each effort at micturition, and

again acquires its former volume as the urine accumulates in the bladder, the presumption is strong that there is a sacculated condition of the mucous membrane. The suspicion is increased, if not converted into certainty, when the swelling disappears through changes in the posture of the patient's body, or under the use of the catheter, which may sometimes, by a happy hit, be passed into the abnormal pouch, and when the patient is laboring under some or all of the rational symptoms above specified. Additional evidence will be afforded if the sac contains a calculus, which never varies its position, but is always perceived at the same point.

Sacculaton of the bladder is always connected with hypertrophy of the muscular tunic, the fibres of which, as already stated, exhibit a plexiform arrangement, and are often three or four times the natural thickness. The mucous membrane and submucous connective tissue are also more or less altered, the former being frequently thrown into large folds, especially in the bas-fond of the organ, and the latter converted into a tough, grayish substance, very different from the healthy texture. The peritoneal covering is generally sound. More or less disease commonly exists in the ureters and kidneys, similar to what occurs in hypertrophy of the bladder apart from any protrusion of the lining membrane.

The prognosis of this disease is eminently unfavorable, not so much on its own account as on that of the morbid changes with which it is generally associated, and which are commonly of an incurable nature. Owing to the peculiar arrangement of the sacs and the absence in them of muscular fibres, their contents are rarely, if ever, entirely expelled; the consequence is that they soon become a source of irritation to their lining membrane, followed often by inflammation, and its different products, particularly an inordinate secretion of mucus, or of mucus and pus. Sometimes they become the seat of a large abscess. Gangrene occasionally seizes upon them, and in a few rare instances they have given way at one or more points, followed by an escape of their contents into the pelvic cavity, and the development of fatal peritonitis.

No kind of treatment, either local or general, is of any avail in this affection, the morbid changes of which are entirely beyond the influence of remedies. The only method that can be adopted

is to remove the exciting cause, and thus prevent any further increase of the difficulty. Any impediment, therefore, to the flow of urine should be sought for, and promptly attended to. The water should be passed at regular intervals, or drawn off with the catheter, to protect the bladder from overdistention and undue exertion. Any inflammatory complications that may manifest themselves must be met by appropriate remedies.

CHAPTER III.

FUNCTIONAL DISEASES OF THE BLADDER.

THERE are certain affections of the bladder, of which, in many cases, the cause is undefinable, and in which there is often no appreciable lesion. These maladies are usually discussed under the head of nervous diseases, or neuroses, and include irritability, spasm, neuralgia, and paralysis, or conditions marked by increased, diminished, or perverted sensation, contractility, and tonicity; or, in other words, functional derangement. In the majority of instances, however, the affections belonging to this group can be traced to inflammation, mechanical obstruction, or changes of structure of some portion of the urinary tract, when the functional disorders are merely denotive of various pathological alterations. Hence, it may not be strictly correct to treat of symptoms as specific diseases; but these conditions are so common, so troublesome, and so harassing to the patient, that, in accordance with the usual custom, I shall describe them as distinct affections.

SECT. I.—IRRITABILITY OF THE BLADDER.

In the absence of positive facts, the most plausible conclusion, perhaps, is that irritability of the bladder consists in an exaltation of the nervous sensibility, or hyperæsthesia, of the mucous membrane, particularly at the neck of the organ, whereby it is rendered intolerant of the presence of the urine, which is voided with greater frequency than in the natural state. The disease is not peculiar to either sex, to any period of life, or to any particular temperament, habit, or occupation. I have, however, most frequently met with it in children and in persons about the age of puberty, and in individuals who are naturally of a nervous, irritable disposition, or prone to attacks of gout and rheumatism. A very unpleasant and intractable form of vesical irritation occasionally occurs in weak, scrofulous subjects.

There is a variety of this affection peculiar to young boys and girls, in which the intolerance of the bladder occurs chiefly at night, during sleep. Particular mention will be made of this variety in the chapter on Incontinence of Urine. The malady may affect the whole bladder, or only a part of it; in most cases it is limited to the neck of the organ, and to the prostatic portion of the urethra; regions remarkable for their sensibility both in health and in disease.

When the affection is fully established, the patient is obliged to urinate every few minutes, and is hardly ever entirely free from suffering. The act, which is generally more frequent in the day than at night, and in the erect than in the recumbent posture, is accompanied with tenesmus, particularly distressing in obstinate cases, more or less straining, pain at the neck of the bladder, and a sense of scalding in the urethra. The stream of water may be natural, or variously altered in its form and force. Thus, it may be forked, twisted, or spiral, strong and full, small and feeble. In many cases, it is ejected in jets, or voided in drops. The fluid again may be normal as to its quantity and quality, or it may deviate more or less from the healthy standard. In general, it is acid, high-colored, and surcharged with mucus. In consequence of the straining, the patient often suffers from irritation of the rectum, hemorrhoids, partial prolapse of the mucous membrane, and pruritus of the anus, or the parts around. The urethra and the prostate gland are generally unnaturally sensitive to the touch, and hence much difficulty is frequently experienced in attempting to introduce a catheter or bougie, which, from the spasm which it excites, is sometimes grasped with extraordinary firmness. A very common accompaniment of this affection, especially in young men, is a tendency to erections and seminal emissions. Indeed, there are few cases between the ages of twenty and thirty, in which this symptom is entirely absent. Neuralgic pains of the bladder, the penis, testicles, and spermatic cord, are also frequently present, and greatly aggravate the local distress.

As the disease wears on, the general health, perhaps originally good, gradually suffers. The digestive organs lose their tone; the appetite is impaired; the bowels are constipated; and the patient is harassed with flatulence, colicky pains, and acid eructations. The extremities are cold, the sleep is disturbed, the

flesh wastes, and the mind is gloomy and despondent. Such is a faint picture of the miserable condition which attends irritability of the bladder in its confirmed stages, and in its more aggravated forms.

This disease is sometimes mistaken for stone. Of this occurrence I have seen numerous examples, the true nature of which can only be cleared up by the use of the sound. As the instrument advances through the curved portion of the urethra, the canal will be found to be so extremely sensitive, as to cause the compressor muscle to contract spasmodically, and prevent for a moment its onward passage. When it reaches the prostatic portion, the patient will feel nauseated or faint, or, possibly, have a violent erection; and as it approaches the neck of the bladder the desire to urinate will be uncontrollable. If this part of the viscus be inflamed, the contact of the instrument will provoke intolerable pain; the sphincter closes, and in the attempts to pass the sound, the organ will be pushed before it, so that it may appear to have entered it. If it be left to itself, however, it will be partially pushed out by the restoration of the neck to its natural position; when the spasm will soon disappear and the instrument will enter by a sort of suction process.

Irritability of the bladder may be arranged under different heads, according to the causes by which it is induced, or the circumstances under which it is developed. 1. Disease of the urinary apparatus. 2. Altered state of the urine. 3. Diuretic medicines. 4. Disorder of the genital organs. 5. Disease of the alimentary canal. 6. Lesion of the brain and spinal cord. 7. General debility. 8. Exposure to cold and heat. 9. Disease of the pelvic viscera.

1. Disease of the urinary apparatus, no matter what may be its character or situation, is a frequent cause of vesical irritability. Persons affected with stricture of the urethra, vascular or papillary growths at the orifice of this canal, contraction of the meatus, stone, vesical catarrh, hypertrophy of the muscular coat of the bladder, ulceration of the mucous membrane of this organ, enlargement of the prostate gland, and disease of the ureters or kidneys, are seldom free for any length of time from this kind of irritability, which, in some of the maladies here mentioned, is often a source of the most frightful suffering. The presence of a tumor, a clot of blood, inspissated mucus,

fibrinous exudation, or purulent matter—in short, of any foreign or adventitious substance—invariably leads to the same result. A considerable degree of irritability of this organ sometimes succeeds to the operation of lithotomy, external injury of the bladder, and perineal fistule.

Gonorrhœa is a fruitful source of vesical irritability. The inflammation which characterizes this disease is often suddenly transferred from the urethra to the neck of the bladder, giving rise to frequent micturition, tenesmus, and severe pain in passing the last drops of urine, which are occasionally mixed with blood or pus.

Irritability occasionally results from congestion of the neck of the bladder, the prostate gland, and the seminal vesicles. These organs, like other parts of the body, are liable to impeded circulation, or stagnation of blood, causing simply turgescence of the vessels, and morbid sensibility of the mucous membrane. The condition is similar to that of the retina in certain forms of amaurosis, and most commonly occurs in robust, plethoric subjects, between twenty and forty years of age. It is characterized by a feeling of fulness in the perineum, almost uninterrupted micturition, and smarting of the neck of the bladder, with a scalding sensation of the urethra. Sometimes the patient is conscious of a strong throbbing in the parts. These symptoms, which are always aggravated by exercise, and even by the erect posture, are liable to be renewed by the slightest exposure to cold, by a full meal and a few glasses of wine, by drastic purgatives, and by venereal excesses.

2. Irritability of the bladder is frequently induced by an altered state of the urine, which produces nearly the same effect upon the bladder as a foreign body. The fluid is generally more or less acid, dark-colored, and strongly disposed to become ammoniacal. It often deposits a copious sediment of mucus, is unusually scanty, and is speedily decomposed after being voided: This form of irritability is most common in elderly subjects, particularly such as are predisposed to gout, rheumatism, and gravel. Males are more liable to it than females. The disease is usually associated with disorder of the general health, which is, doubtless, the immediate cause of the altered state of the urine upon which it depends. The most prominent symptoms are dyspepsia, constipation, capricious appetite, sour eructations,

coldness of the extremities, dryness of the skin, soreness in the lumbar region, neuralgic pains in various parts of the body, and a sense of burning in the urethra. In protracted cases, the altered secretion is sometimes directly dependent upon a morbid condition of the kidney.

The presence of pus in the urine must not be overlooked as a cause of this affection. The matter may be derived from an inflamed kidney or ureter, or it may be due to the bursting of a pelvic abscess into the bladder, after parturition. Under these circumstances, the irritability is liable to be excessive and protracted, the viscus being in a state of continued tenesmus.

3. An irritable state of the bladder sometimes results from the use of diuretics. The article most liable to produce this effect is cantharides. When taken internally, in an excessive dose, it acts promptly upon the urinary organs, causing great distress at the neck of the bladder, with burning of the urethra, and the most urgent desire to void the urine, which comes off drop by drop, usually tinged with blood, and accompanied by severe spasm and straining. These symptoms are generally attended by the most violent erections. Exhibited in smaller quantities, the effects are more mild, but hardly less persistent, and, in the aggregate, less distressing. Nitrate of potassa sometimes acts with extraordinary power upon the urinary apparatus. I have known an overdose produce effects upon the bladder very similar to those of cantharides, and scarcely less severe. When administered for a long time as a diuretic, it seldom fails to irritate the neck of the bladder, and occasion frequent micturition. Vesical irritability is often induced by the use of stimulating drinks, fruits, and vegetables, causing an excess of acid in the urine, with a morbid sensibility of the mucous membrane.

4. Venereal excesses, whether in the form of frequent coition, masturbation, or involuntary losses, are prominent exciting causes of this affection; but a more fruitful source of the trouble is ungratified sexual appetite, from toying with females without consummating the venereal act. I have met with many examples of this nature, particularly in young men; and as the constant indulgence in this pernicious practice is liable to be followed by impairment of the virile powers, the sufferers usually consult the practitioner on account of loss of confidence which renders them temporarily impotent.

In boys, a marked degree of irritation about the neck of the bladder is produced by a long and narrow prepuce, rendering the affection liable to be mistaken for stone. The existence of this malformation usually prevents the ready escape of the urine, in consequence of which the edges of the foreskin become inflamed and sore, causing frequent desire to pass water, accompanied with severe pain and even spasm. Similar symptoms are sometimes due to the accumulation and decomposition of the preputial smegma, and to congenital narrowing of the meatus.

5. Disorder of the digestive apparatus is capable of producing this disease. The sympathy which exists between the stomach and urinary bladder is familiar to every physiologist and pathologist. There are few confirmed dyspeptics who are entirely free from this disease. The digestive powers of such persons are habitually enfeebled; the stomach is sour and flatulent; the bowels are costive; and the urine is scanty, high-colored, and surcharged with lithic acid, or lithate of ammonia.

An irritable state of this organ is sometimes produced by the presence of *tæniada*, *ascarides*, hardened feces, foreign bodies, hemorrhoidal tumors, carcinomatous disease, ulceration, or fissure, of the mucous membrane of the rectum, organic stricture, anal fistule, and prolapse of the bowel. Pruritus of the anus, nates, and perineum, may also give rise to it. The irritation in these cases is often excessive, and closely resembles that produced by stone in the bladder.

6. An irritable state of the bladder is occasionally dependent upon lesion of the nervous system. Many years ago I attended a gentleman on account of concussion of the spinal cord, produced by a fall upon the lumbar region from a wine cask. The most prominent symptoms, during the first three days, were disorder of the intellectual faculties, and an almost incessant inclination to void the urine, which was remarkably copious and limpid. As the concussion subsided, the desire became less frequent, and the fluid gradually resumed its normal characters. Similar effects are often noticed in injuries of the vertebral column and organic disease of the spinal cord, attended with partial paralysis of the bladder. The urine, in such cases, is always exceedingly acrid, high-colored, offensive, surcharged with glairy mucus and phosphatic matter, and passed with preternatural frequency.

A considerable degree of morbid sensibility of the bladder is sometimes produced by congestion of the brain, or nervous exhaustion, brought on by mental fatigue, or inordinate excitement. Cases of this description, which are not by any means infrequent, are most common in elderly men, of sedentary habits, and of a nervous, excitable temperament.

Mere mental emotion will occasionally induce the affection, as a violent paroxysm of fear, grief, or anger. Again, an irritation seated in a remote part of the body has been known to give rise to it. Pinel saw an instance of it, caused by disease of the thyroid gland.

Irritability of the bladder has sometimes been induced by the habit of too frequent micturition. The urine is the natural stimulus of the organ, and if this is too often withdrawn, a certain degree of intolerance is apt to be engendered. The organ, under the influence of this habit, gradually diminishes in size, the muscular fibres are thickened, and the mucous membrane becomes so sensitive as to be unable to bear the slightest distention. Literary men often suffer in this way, especially if they are dyspeptic, or predisposed to gout and rheumatism.

There is a form of vesical irritability, very common in young girls, soon after the age of puberty, which may be appropriately included under the present head, though, as it respects its origin, it is probably of a mixed character. The affection is generally associated with spinal irritation, and dysmenorrhœa, or imperfect menstruation. The extremities are cold, the bowels constipated, the tongue coated, the appetite impaired, and the digestion languid and difficult. The patient, moreover, is flatulent, nervous, and troubled with palpitation of the heart, the action of which is hurried by the slightest agitation and exertion. The disease frequently lasts for years, and sometimes during the greater part of life.

7. Among the causes of this disease may be mentioned any considerable and long-continued debility, such as occurs from immoderate venery, spermatorrhœa, onanism, hemorrhage, and chronic diarrhœa. It is occasionally a sequel of typhus, typhoid, and other fevers, especially when the disease has been very protracted, or treated too energetically. *

8. Exposure to cold, or sudden suppression of the cutaneous

perspiration, is sometimes followed by this affection. This is occasionally noticed in persons who, after having been immersed for a long time in a hot atmosphere, suddenly go out into the open air in a cold winter day. The first effect of such a transition is a chilly state of the surface, and an arrest of the perspiration, which are often succeeded in a few moments by a desire to void the urine, so urgent as hardly to admit of any delay. Exposure to the rays of the hot sun is capable of rendering the bladder temporarily irritable. I have seen several instances in which the disease appeared to have been thus induced. The patients were all field laborers, and had been engaged at hard work in intensely hot weather; the affection was characterized by an incessant inclination to micturate, by excessive scalding at the neck of the bladder, and by a sense of general prostration, lasting several hours before it could be relieved.

9. Finally, an enlarged ovary, a displaced, gravid, or diseased uterus, or a morbid growth of the pelvis, may occasion symptoms of vesical irritability. The effect may be purely reflex, or it may be caused by pressure on the bladder. Accoucheurs are well aware of this occurrence, of which I have seen several well-marked examples. The affection is most common in old and middle-aged females, although it may take place at any period of life.

From what has been said respecting the causes of this affection, it is not surprising that so little should be known of its pathology. As the disease, in its idiopathic form, never of itself proves fatal, opportunities of ascertaining, by dissection, the exact condition of the parts, are exceedingly infrequent; and in the few cases in which they have been afforded no satisfactory results have been observed. The most plausible theory is that the complaint consists in an exaltation of the nervous sensibility of the mucous membrane, similar to what is occasionally witnessed in the retina, the fauces, urethra, and other mucous canals. What strengthens this opinion is the fact that it is frequently connected with a weak, scrofulous state of the constitution; and that, when this is the case, it generally resists every mode of treatment that has yet been devised for its relief; affording thus an analogy, and that a very striking one, to certain forms of strumous ophthalmia, alike distressing to the patient and

troublesome to the surgeon. The bladder, in the more confirmed stages of the affection, is much contracted, but its coats, instead of being thickened, are generally preternaturally thin, and remarkable for their pallor.

When the complaint depends upon local causes, as stone in the bladder, stricture of the urethra, or enlargement of the prostate gland, the anatomical changes are more distinct, and afford a more satisfactory solution of the real nature of the case. Under such circumstances, there are always, or nearly always, evidences of inflammation or congestion of the lining membrane and hypertrophy of the muscular fibres, with alteration of the secretions, and, in some instances, slight deposits of lymph.¹

Very frequently, as was previously remarked, the irritability is purely sympathetic, depending upon lesion of some neighboring organ, as the kidney, seminal vesicle, penis, anus, uterus, stomach, or bowel. I have already alluded to an instance in which it seemed to have been produced by a diseased condition of the thyroid gland; and the fact that it is occasionally excited by congestion or organic lesion of the brain, independently of any appreciable structural change of the bladder, is familiar to every pathologist.

The prognosis of this affection is influenced by so many contingent and concomitant circumstances, that any remarks that may be made respecting it must of necessity be vague and indefinite. This will not appear strange, when we take into consideration the great number and variety of causes by which it is induced and maintained. The idiopathic form of the complaint, although frequently very obstinate, generally, after a time, yields to a well-directed course of treatment. When the disease occurs in weak, scrofulous subjects, it is always remarkably intractable, frequently lasting for years, or ending, perhaps, only with life. The irritation of the bladder of young children, attended with nocturnal incontinence of urine, sometimes dis-

¹ In a young man, who was affected with urinary calculus, the membranous and prostatic urethra and neck of the bladder were extremely sensitive upon instrumental contact, and frequent micturition was a prominent symptom. On dissection, by the editor, immediately after death from lithotomy, these parts were seen to be the seat of linear injection, the enlarged bloodvessels corresponding with the natural folds of the urethra.

appears spontaneously towards the approach of puberty, while at other times it is exceedingly rebellious, and successfully resists the most judiciously devised means of the physician to overcome it. Hysterical irritability seldom continues long, although it is not always readily amenable to treatment.

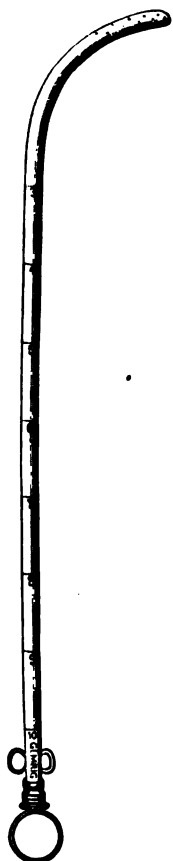
When dependent upon local causes, of a curable nature, prompt relief may generally be obtained. All, in fact, that is necessary, in such cases, is to remove the source of the irritation, and the disease will subside of its own accord. Under opposite circumstances, however, the complaint is commonly irremediable, however judicious our efforts to combat it. Thus, nothing can be done, with any reasonable hope of success, for a case of irritability of the bladder, caused by carcinoma of the rectum, an enlarged ovary, or a tubercular kidney; and so of many other forms of the disorder.

In entering upon the treatment of this complaint, so Protean in its character, a strict inquiry should, in every instance, be instituted into its origin, which, as has been already seen, may be either sympathetic, nervous, congestive, or inflammatory; and the practice regulated accordingly; otherwise the physician will only be likely to harass his patient, and employ means which can lead to no beneficial result. Indeed, it may be confidently affirmed that there is no class of diseases which demand a more thorough investigation to enable him to form a correct judgment upon the parts primarily affected than this. The truth of this remark is fully borne out by the long catalogue of causes under the influence of which this disorder is developed, and which no one can read without being impressed with the importance of a most profound knowledge of the physiology and pathology of the urinary apparatus.

The exciting cause of this complaint having been ascertained, the first thing to be attempted is, if possible, to remove it. All venereal excesses or irregularities must be abandoned. Of the internal remedies which may be advantageously employed in most of the varieties of the affection, I have found that belladonna, in the form of the sixth of a grain of the extract, or five drops of the juice, repeated every six or eight hours, is the most useful. Small doses of balsam of copaiba are particularly applicable to irritability dependent upon the extension of gonorr-

rhœal inflammation, vesical catarrh, and organic disease of the kidney. In young children and hysterical girls, I have derived great benefit from the tincture of cantharides, combined, when a tonic is at the same time indicated, with the tincture of the chloride of iron. When the irritability arises from sexual irregularities, I know of no remedies so well calculated to be productive of good effects, as the bromide of potassium, or ammonium, in doses of thirty grains, along with fifteen grains of chloral hydrate, for an adult, thrice in the twenty-four hours.

Fig. 10.



Catheter Syringe.

Of the local measures to allay the disordered sensibility of the affected parts, by far the most reliable is the gentle introduction of a conical steel sound of moderate size, which should, at first, be instantaneously withdrawn. As the sensitiveness decreases, it is retained for three or four minutes; and a larger instrument should be substituted, until the hyperæsthesia is completely obtunded. The operation may be repeated, as a rule, every forty-eight hours. Should the introduction of the sound aggravate the local distress, its use must be preceded by sedative and astringent injections, such as two grains of nitrate of silver and five grains of opium to the ounce of water, or half a drachm of Goulard's extract and eight grains of the watery extract of opium to four ounces of water. The fluid is conveyed to the seat of the disease by means of the catheter syringe represented in fig. 10, exemption from pain

being secured by passing the nozzle only through the opening in the triangular ligament.

SECT. II.—SPASM OF THE BLADDER.

The characteristic symptom of spasm of the bladder is sudden, uncontrollable, excessively painful, and remitting contractions of the organ, during which the urine may be discharged by

drops, or in an irregular, jerking stream, or, as more frequently happens, there is retention of that fluid until the attack passes off. The suffering is exquisite, and is reflected along the urethra to the head of the penis; while the desire to empty the bladder is constant and attended with violent tenesmus, often terminating in rupture of the capillary vessels of the neck of the viscus, and, as a result, in the emission of a few drops of blood at the completion of each act of micturition.

The true cause of this affection is not always appreciable. It may generally, however, be traced to cold, the suppression of the cutaneous perspiration, hysteria, acid urine, pyelitis, gravel, the presence of a calculus, clots of blood, or a tumor in the bladder, vesical catarrh, or ulceration, organic lesions of the prostate, stricture of the urethra, the extension of gonorrhœal inflammation, pelvic hematocoele, abscesses in the neighborhood of the bladder, metritis or perimetritis, carcinoma of the rectum, ascarides, hemorrhoidal tumors, fissure of the anus, operations on the rectum, and the effects of turpentine and cantharides.

When the trouble has existed for some time, or proved rebellious to ordinary measures, it very commonly results in concentric hypertrophy of the bladder, the organ being incapable of retaining more than a few drops of urine at a time; and the patient becomes emaciated and exhausted from the suffering induced by the frequent recurrence of the attacks. Under these circumstances, the spasmodic affection may be mistaken for stone, and cystotomy has been performed in several instances with the happiest effect, although no calculus was found.

The treatment of spasm of the vesical sphincter and muscles of the curved urethra, upon which the affection essentially depends, must be conducted, in the first place, upon the recognition and removal of its exciting cause. The attack itself, from whatever lesion it may arise, is allayed by the warm bath, hot fomentations, and the inhalation of chloroform, aided by the free use of camphor and opium, either by the mouth or rectum, or by hypodermic injections of morphia. When the symptoms of retention are urgent, recourse is had to the soft catheter, which often overcomes the spasm in an instant, long before it has reached the bladder. When the introduction is difficult, the instrument should be gently pressed against the obstruction

and then suddenly withdrawn; a manœuvre which rarely fails to be followed by complete relief.

In unusually obstinate cases, attended with breaking down of the general health, the best chance of obtaining any permanent benefit is afforded by putting the bladder at rest, by an incision carried through the membranes and prostatic portions of the urethra and the neck of the organ. In this way, particularly if the wound be kept open for several weeks, an outlet is formed for the constant escape of the urine, without any exertion on the part of the muscular fibres involved in the disease. The bladder may be reached by lateral incisions, as was originally suggested by Mr. Bickersteth;¹ or through the median line, with extensive division of its neck, as has been successfully practised by M. Parona.² Subcutaneous incision of the neck of the bladder has also been resorted to in this affection, but without any marked result.

In females, in whom this symptom is by no means uncommon, I have in four instances succeeded in effecting permanent relief by rapid dilatation of the urethra and neck of the bladder, by means of the finger and the instrument represented in the chapter on Stone in the Bladder of the Female. In this way, the parts are put thoroughly at rest, and recovery is rapid. In two of my cases there was incontinence of urine, respectively, for three and five days. Equally gratifying results have been obtained by Dr. Howe,³ and by Mr. T. Pridgin Teale,⁴ Mr. Heath,⁵ Mr. Hewetson,⁶ and Dr. Edis,⁷ of England.

SECT. III.—NEURALGIA OF THE BLADDER.

As the name imports, neuralgia of the bladder is a nervous affection, characterized by severe suffering, which is generally referred to the neck of the organ. It presents itself in two varieties of form, in one, and the more common, of which, the suffering is more or less steady and persistent, often remitting, but seldom intermitting; while in the other, it is distinctly

¹ Liverpool Medical and Surgical Reports, vol. i., 1867, p. 134.

² Brit. and For. Med.-Chir. Review, January, 1876, p. 243.

³ Medical Record, vol. x. p. 550.

⁴ London Lancet, vol. ii., 1875, p. 766, and vol. i., 1876, p. 85.

⁵ Ibid., vol. ii., 1875, p. 858.

⁶ Ibid., vol. ii., 1875, p. 796.

⁷ Ibid., vol. ii., 1875, p. 999.

paroxysmal, occurring daily, or every other day, about the same period. During my residence in Kentucky I witnessed many examples of it, six of which were detailed in a former edition of this work.

In the early stage of this disease, the symptoms are frequently vague and ill-defined. At first, there is merely a sense of uneasiness in the perineal region, accompanied with a sharp, darting, or tingling pain, recurring only at long intervals. Sometimes, in addition to the shooting pain, there is an unpleasant aching, with a feeling of numbness. In this manner three or four days may elapse before the disease attracts any particular attention. By degrees the attacks become more frequent, as well as more severe, and assume a decidedly periodical character, returning about the same hour every day, generally early in the evening or towards morning. The paroxysms vary in their duration from two to six hours, and, while they continue, the suffering is often of the most racking and agonizing nature. The pain, which is commonly of a sharp, stabbing, darting description, is distinctly referred to the neck or inferior part of the bladder, and bears a very exact resemblance to that produced by a fit of the stone. In most cases it extends to the neighboring organs, as the rectum and anus, the urethra, and the inside of the thighs. In the female it is occasionally reflected upon the uterus, and in the male along the course of the spermatic cords. In both sexes it is generally very severe in the sacral and lumbar regions. Coincident with this is a sensation of heat and burning in the urethra, with a frequent desire to make water, which is always attended with difficulty. The burning or smarting is particularly distressing at the extremity of the penis, from which it frequently extends to other parts, as the pubes, groin, anus, or sacrum. The urine is thrown out in jets, or the stream is suddenly arrested, and the smaller the quantity in the bladder the greater is the suffering in voiding it.

The paroxysm generally goes off gradually, leaving no other inconvenience than a sense of soreness or aching in the neck of the bladder, perineum, and posterior part of the urethra. During the intermissions the urine is voided without difficulty, and the patient feels comparatively comfortable, almost as well, indeed, as if he had not suffered any pain. When the attacks assume the quotidian type, they usually occur, as was before intimated,

in the evening, during the night, or early in the morning. Occasionally they make their appearance soon after eating, and in a few instances they have been known to recur twice in the twenty-four hours; thus leaving the poor patient scarcely a moment free from distress.

Fever rarely accompanies this affection, however obstinate or protracted. The appetite is variable and capricious, the stomach is teased with flatulence, digestion is bad, and the patient feels uncomfortable after eating. The bowels are disposed to be torpid, and require to be regulated by medicine. The sleep is interrupted and unrefreshing; the pulse, which at first is not perceptibly altered, becomes quick and irritable; the feet and hands are habitually cold; the general health gradually declines; and the countenance wears an anxious, haggard look. In inveterate cases, there is a discharge of thin gleety matter from the bladder, with great soreness in the perineum and hypogastric region. Another symptom which is occasionally present is a sense of coldness in these parts, which frequently extends to the groin and inner parts of the thighs, and is almost constantly accompanied with some degree of numbness. The urine is almost always natural, both in regard to quality and quantity, except in gouty and rheumatic subjects, in whom it is generally acid, scanty, and charged with lithates.

The diagnostic signs of this disease are not always very distinct. The attacks, especially when very severe, bear the closest resemblance to the paroxysms produced by a calculus, and they are frequently associated with, if not dependent upon, other affections. Hence, in doubtful cases, sounding of the bladder is advisable, and should never be omitted. On the whole, the most important signs, perhaps, are the paroxysmal character of the disease, the sharp and darting pains, the uncomfortable itching and scalding in making water, the attempts at which are very frequent, urgent, and difficult, and the numbness of the perineum, scrotum, groins, and thighs.

Of the causes of vesical neuralgia very little is known. In general, indeed, they are wholly inappreciable. It is often associated with disease of the neighboring organs, but how far it is influenced by, or dependent upon it, it is impossible, in the present state of our knowledge, to determine. In some cases it is complicated with obstinate amenorrhœa; in others it has been

known to supervene upon parturition, to continue for several months, and then totally disappear. It is observed, for the most part, in persons of a nervous temperament, and in those who are subject to the same malady in other regions of the body. Venereal indulgences, masturbation, stricture of the urethra, stone in the bladder, organic disease of the uterus, and hemorrhoidal affections, are all capable of exciting it. In the case of a married woman, twenty-nine years of age, under my care in 1846, it was due to a tumor of the left nympha, the excision of which was followed by a rapid and permanent recovery. Habitual constipation of the bowels, dyspepsia, mental emotions, and a depraved condition of the urinary secretion, are also circumstances which favor its production. What influence, if any, miasm exerts upon its development is not ascertained. Judging from my own experience, however, it is without doubt a very frequent cause. An elderly gentleman whom I attended several years ago, was subject to neuralgic attacks of the bladder and right knee, which generally lasted eight or ten days at a time, then disappeared and recurred about once every three months. In early life he had been severely affected with rheumatism, and a short time before the vesical neuralgia came on he had labored under intermittent fever, which left him with an enlarged and indurated state of the spleen.

Neuralgia of the bladder is not confined to any particular period of life, although the old and middle-aged are without doubt most subject to it; and I have met with it as early as two years of age. Nor is it peculiar to the male sex. Women not infrequently suffer from it, but in what proportion is a point concerning which we are still ignorant.

Vesical neuralgia, although an exceedingly painful and distressing disease, seldom terminates fatally. Of this occurrence I have only met with two examples, one in a man twenty-eight years of age, the other in a child two years old; death in both instances having been due to exhaustion induced by protracted suffering. In many cases, perhaps the majority of them, it is remarkably obstinate, and persists for weeks or even months, in spite of the best-directed treatment; on the other hand, instances occasionally occur which disappear almost as suddenly as they come on. This is especially the case when the disease has a miasmatic origin, or when it supervenes upon intermittent fever.

Occasionally it continues with but little intermission for several years, thus undermining the general health, and laying the foundation of serious and irreparable mischief.

It is obvious, from what has been already stated, that the treatment of this affection must be regulated by the causes by which it is induced; but it must not always be expected that the disease will rapidly disappear upon the removal of the exciting cause. There are cases in which it is inclined to linger, with little or no mitigation, for an indefinite period, despite the faithful employment of remedies. When the affection is attended with inflammatory symptoms, especially when there is tenderness in the perineum, the course of the urethra, the sacrum, or the loins, prompt and efficient bloodletting is the remedy upon which, in the commencement, great reliance may be placed. Mercurial purgatives are decidedly useful in that form of neuralgia dependent upon a miasmatic origin, derangement of the digestive apparatus, or disordered menstrual action: when the disease is of miasmatic origin, quinine should be administered in doses of ten grains every eight hours, until thirty grains have been taken. It should then be discontinued until the next day, when it should be resumed, and persevered in until the same quantity is taken. When the violence of the malady has been thus moderated or subdued, its action should be maintained by smaller doses, in combination with antineuralgic remedies. An excellent formula which I have been in the habit of using for many years is, two grains of quinine, half a grain of extract of aconite, the twentieth of a grain of morphia, the thirtieth of a grain of strychnia, the fifteenth of a grain of arsenious acid, and the fiftieth of a grain of atropia, given in pill form three or four times in the twenty-four hours. In persons of a gouty, rheumatic habit, colchicum is the proper remedy.

To moderate the violence of the paroxysm, large doses of morphia, either alone or associated with tartar emetic and tincture of aconite, according to the state of the vascular system, are indispensable. When the pain is very violent, the anodyne should be thrown under the skin, and the patient be brought under the influence of chloroform. An emetic, at the approach of the attack, will sometimes cut it short, or abridge it, particularly when it is associated, as it often is in malarious districts, with gastric and biliary disorder. Much benefit will also accrue from

the warm bath, the application of steam, or fomentations of hops and laudanum to the affected part. In the more aggravated forms of the malady, counter-irritation, in the form of the actual cautery and the caustic issue, over the perineum, the hypogastrium, the sacrum, or inner part of the thighs, is worthy of trial. Finally, the gentle introduction of the conical steel sound is sometimes followed by prompt and decisive benefit; but should it aggravate the local distress, its use must be abandoned. The strictest attention should be paid to the diet; everything tending to disorder the digestive organs, and induce acidity and flatulence, being avoided. Dyspepsia should be relieved by tonics, and large doses of subnitrate of bismuth, rubbed up with bicarbonate of soda, pulverized gum Arabic, ginger, and camphor. Flannel should be worn next the skin; exposure of all kinds should be sedulously guarded against; and sexual intercourse should be prohibited, except at regular intervals.

SECT. IV.—PARALYSIS AND ATONY OF THE BLADDER.

When the bladder is deprived, wholly or in part, of the power of expelling its contents, it is said to be in a state of paralysis. It is important to know that the affection may be of eccentric or centric origin, or, in other words, that it may be dependent upon causes inherent in the organ itself, or upon a diseased condition of the brain or spinal cord. Another distinction, long ago recognized by Zubert and other German authors, is into paralysis of the neck of the organ, and paralysis of its body. This arrangement is of no little practical importance, inasmuch as the first variety of the affection is generally attended with incontinence, and the other with retention of urine.

1. *Atony or Paralysis of the Bladder from local causes.*—Closely allied to true paralysis, or paralysis from disease, or injury of the cerebro-spinal axis, is atony of the viscus. By many modern writers this condition is considered to arise from a loss of tone of the muscular walls, from overdistention, and, as it is of local origin, they endeavor, but not very satisfactorily, to separate the two affections, not seeming to recognize the fact that palsy may be due to eccentric as well as centric lesions of the nervous system. Now it is not true that atony arises in all cases merely

from overdistention of the muscles of the bladder. The essential difficulty resides not in the muscles, but in the nerves of the organ, which are stretched and compressed by the accumulation of urine, whereby they are prevented from transmitting motor force to the muscles which they supply. That the stretching of nerves is followed by impairment of their functions, and diminished or inhibited muscular tension or tonicity, is attested by what is seen in dislocations of the larger joints and attempts at their reduction. In these cases there is decided paralysis of motion, and partial anæsthesia. An example of temporary palsy from compression of the trunk of a nerve, with which every practitioner of any experience is familiar, is the loss of power in the muscles of the hand and forearm from the subject having slept for several hours with his head resting upon his arm. These are instances of muscular paresis from causes altogether independent of centric lesions; and the same is true of the bladder. Atony may, however, depend upon causes which have no necessary or apparent connection with affections of the nervous system. To place the entire subject in a more intelligible light, we will consider each variety of atony separately.

a. There is a form of atony of the bladder to which the term senile may be appropriately applied, as it is almost peculiar to old age. As the body loses its elasticity, the cornea grows dim, and the power of locomotion diminishes, the bladder, participating in the general decay, becomes less capable of expelling its contents. There is no mechanical obstruction to the flow of urine, but simply a want of power in the muscular fibres of the bladder, in consequence of which it contracts feebly and imperfectly. The paralysis is seldom complete, and usually comes on in a slow, stealthy manner, having already, in most cases, made considerable progress before there is any suspicion of its real character. One of the first symptoms which attracts attention is a slight difficulty in starting the urine; the patient is conscious that he is obliged to make a greater effort; and a longer period is required to complete the evacuation. At the close of the discharge, the water comes away in drops, and a portion often remains in the urethra, from which it issues at the end of micturition, thus soiling the linen and causing more or less discomfort. The power of expelling the urine is not usually lost;

but the bladder is never, at any time, entirely emptied, a small quantity of urine being retained in the fundus, where it becomes a source of irritation. As the disease advances, the muscular contractility is still further impaired; and the water, instead of being ejected in a full stream, falls between the patient's legs, being passed without any projectile force.

This variety of atony is altogether independent of nervous troubles. The condition is a physiological one, and is one of the infirmities of advancing years, being associated with a general loss of tone of the muscular and vascular tissues of the body. If the bladders of old men be examined after death, it will be seen that the venous plexuses are greatly dilated, and that the organ is surrounded by an abundance of free fat. Minute inspection, moreover, will demonstrate coincident fatty degeneration of the muscular walls of the viscus; and it is this change which gives rise to the vesical debility of old persons. The dysuria and final retention of urine, if the calls of nature be not promptly obeyed, depend upon fatty changes of the detrusor muscle; while the incontinence is due to the extension of the metamorphosis to the sphincter muscle of the neck and the compressor muscle of the urethra, whereby they are rendered incapable of withstanding the hydraulic pressure from within.

a. In the second place, atony, or local paralysis, may arise from overstretching of the nerves of the bladder, thereby constituting the condition generally spoken of as atony from overdilatation of its muscular fibres. This variety of the affection is most common in advanced life, being often engrafted upon the preceding form; but it may occur at any period, even in the most tender infancy. It is usually produced by a neglect to empty the organ when a desire is felt to urinate, the patient, perhaps, not finding it convenient at the moment, or for some time after, to obey the promptings of nature. When at length he makes the effort, he is unable to succeed, the muscular fibres refusing to perform their duty. In short, they are in a state of paralysis from extension of their nerves, and the most violent straining is incapable of exciting them. Voluntary retention is thus succeeded by involuntary retention; and repeated acts of this description are liable to eventuate in permanent inertia. Old men of sedentary, studious habits, or who take a good deal of exercise on horseback, are very liable to this form of palsy.

Instead of paying due regard to the desire to urinate, they neglect it, and when they finally attempt to empty the bladder, they are frequently unable to pass a drop of water. I have seen numerous cases of this kind, some of which terminated fatally, generally within the first five or six days.

To this class, that is paralysis or atony from local nerve lesions, may be referred the palsy which often follows severe and protracted labor, in consequence of the pressure which the child's head, as it descends into the pelvis, exerts upon the bladder, especially if the urine has not been previously evacuated. In these cases the nerves are not only overstretched by the retained urine, but they are subjected to compression by two forces, one of which acts from within the bladder, and the other from without. The loss of power of conduction on the part of the disabled nerves, under these circumstances, is sometimes so great that their functions are not restored for several weeks.

In this section must also be included palsy arising from external violence. My attention was first prominently directed to this subject nearly twenty years ago, in consequence of being called to a patient who, in a scuffle with a fellow-laborer, had received a kick upon the hypogastric region, his bladder being at the time full of urine. He was seized soon after with severe pain in the pelvis, accompanied with a stinging sensation along the course of the urethra, and an utter inability to pass a drop of urine. The catheter was introduced twice a day for nearly a week before the organ fully regained its functions. The nerves and muscular fibres had evidently suffered violent contusion, in consequence of which the latter had lost their power of contraction. The occurrence is generally caused by the passage of a wheel of a carriage, by blows or falls, or by the body being jammed in between two firm and resisting objects, as a post and a wagon. It is sometimes complicated with fracture of the pelvic bones, and occasionally it supervenes upon injury of the perineum.

2. *Paralysis of the Bladder from general causes.*—Paralysis of the bladder may arise from functional or essential disorders of the brain and spinal cord, the affection being of central origin, and entirely independent of any changes in the organ itself. The causes of this form of palsy may be arranged under the following heads: a, disease or injury of the cerebro-spinal axis;

β , functional exhaustion of the nervous system; γ , reflex action; and, δ , the use of certain remedies.

α . The paralysis dependent upon lesion of the brain and spinal cord is nearly always associated with paraplegia of the lower extremities. The causes which commonly give rise to this affection are meningitis, myelitis, abscess, serous effusions, extravasation of blood, the presence of gummy and other tumors, angular curvature, sprains, concussions, fractures, dislocations, and wounds. In these cases, it may exist in various degrees, from a slight want of muscular power to complete loss; but it is never complete unless it is associated with paralysis of the abdominal muscles. When the paralysis is confined to the neck of the bladder, while the rest retains its faculty of contracting, the consequence will be incontinence of urine. It may disappear in a few hours or a few days, or it may continue for months and even years, if not, indeed, during the rest of life. The paraplegia may pass off, and the paralysis of the bladder alone remain, although in general the reverse is the case, the power of urinating being restored before that of locomotion. I have met with repeated instances illustrative of the truth of this remark.

When the paralysis is associated with paraplegia, the sensibility of the bladder is generally so much impaired that the patient is unconscious of his situation. He suffers no pain or inconvenience, and does not complain of any derangement of the urinary apparatus. The bladder, in truth, is a mere passive reservoir, which often becomes enormously distended before any one is apprised of its condition. It is a matter of paramount importance, therefore, in all cases of injury of the spine and brain, that the practitioner should ascertain, at every visit, whether the patient can void his urine, or whether it is retained in the bladder. He should be careful, moreover, not to mistake the dribbling, which almost always exists in these cases after the first three or four days, for incontinence. When a certain degree of sensibility remains, the pelvic pains, the constant desire to urinate, and the sense of weight and distention in the hypogastric region, usually sufficiently indicate the nature of the complaint. In nearly all instances the palsy comes on immediately after the accident that produces the paraplegia, and in fatal cases obstinately persists to the last.

When the paralysis of the bladder is produced by injury of

the spinal cord, the urine is usually highly alkaline, turbid, of an ammoniacal odor, and surcharged with thick, ropy mucus. Phosphatic matter soon makes its appearance; inflammation is speedily set up in the lining membrane; and, if the patient survive any time, ulceration frequently takes place, followed by a discharge of blood, and even pus. Persons thus affected are very prone to calculous disease: in some instances the whole of the inner surface of the bladder is incrustated with calcareous matter. When the injury is seated in the dorsal region, above the tenth vertebra, priapism is not uncommon.

3. Paralysis of the bladder is frequently witnessed during the progress of low fevers, as typhus, in which there is temporary functional derangement, probably of the restiform bodies of the medulla oblongata. The affection, indeed, is much more common than is usually supposed, and is unfortunately often overlooked by the professional attendant. From ignorance of the subject, or, what is equally culpable, inattention, much suffering is thus sometimes produced; the primary disease is greatly aggravated, and life is brought into imminent danger. The paralysis may occur at any period of the febrile complaint; but is most apt to show itself in the advanced stages, when there is considerable depression of the nervous system. The first link in the morbid chain seems to be a want of sensibility of the bladder, in consequence of which the urine ceases to make its accustomed impression, and continues to accumulate without awakening any desire to evacuate it. When at length the proper inclination is felt, the muscular fibres will be found to have been so much stretched that they are incapable of fulfilling their office. The patient, lying in a state of stupor, drowsiness, or delirium, is unable to indicate his wants, and thus the distention goes on increasing until the bladder is in danger of bursting. When some degree of sensibility remains, he makes known his suffering by his moans and restlessness, and by placing the hand upon the hypogastric region, by grasping the penis, or by making ineffectual efforts to void his urine. In complete insensibility, he is unconscious of any inconvenience.

In this division of the subject may be included the palsy which results from functional spinal debility, caused by inordinate sexual indulgence, or long-continued onanism. The defect, which

is most common in old men, occasionally occurs in young subjects, and rarely exists in a complete degree.

7. Paralysis from reflex irritation is not uncommon, particularly after operations for hemorrhoids. It occasionally supervenes upon compound fractures and dislocations, severe injuries of the lower extremities, wounds of the bowels, strangulated hernia, and contusions of the walls of the abdomen. Every surgeon is aware that the bladder sometimes loses its power of contraction after amputation of the thigh and leg, the removal of large tumors, and other important operations.

8. Great torpor of the bladder, amounting to actual paralysis, may follow the use of opium, hyoscyamus, and belladonna. The paralysis, generally slight at first, may ultimately, by a continuance of the remedy, become so complete as to require the catheter for the evacuation of the urine.

Whatever may be the cause of the paralysis, or the circumstances under which it takes place, the symptoms which attend it are, in general, sufficiently well marked. As soon as the bladder has lost its power of contraction, its contents accumulate and distend its walls. The organ, thus pressed upon in every direction, gradually rises above the pubes into the hypogastric region, forming a tumor which ascends sometimes as high as the umbilicus, and as far outwards on each side as the brim of the pelvis. The swelling is of an ovoidal shape, fluctuating, indolent at first, but painful afterwards, and attended with complete retention, which constitutes the characteristic symptom of the affection. After the paralysis has continued for several days, the water generally dribbles off in drops, and thus incontinence is added to the retention. It is to this form of retention that I applied, twenty-five years ago, the term incontinence of retention, which is synonymous with the more modern, but less appropriate, expression, engorgement with overflow, in the hope of attracting particular attention to it. In the milder forms of the malady, the power of contraction is only diminished, not entirely lost, and a portion of the urine is still voided, under the influence of the will, either at regular or remote intervals. The duration of the paralysis varies from a few hours or days to several weeks, months, or even years. Occasionally it ceases only with life.

It is unnecessary to give a detailed account of the changes ob-

served in this disease after death. As in other vesical affections, signs of congestion or of inflammation are generally discovered in various parts of the lining membrane; the muscular fibres are pale and indistinct, and the parietes of the organ are remarkably thin, flabby, and attenuated. In some instances, blackish, dark-colored, or grayish spots are visible, and are evidently the effect of incipient gangrene. In neglected cases, or in those which run their course very rapidly, the different coats are very much softened, and hence they sometimes give way at one or more points, followed by an escape of the urine into the general peritoneal cavity. When the paralysis is of long standing, it is not unusual to meet with ulcers and phosphatic incrustations of the mucous membrane. Disease of the associated organs is by no means uncommon, but does not form a necessary concomitant or consequence.

The prognosis of vesical paralysis can be correctly estimated only by an attentive consideration of its causes. Much will also necessarily depend upon the treatment, the age of the patient, the state of the system, and the duration of the disease. When the retention of urine, which constitutes, as has been already stated, the characteristic symptom of the affection, is not early relieved, a long time must necessarily elapse before the elongated and overstretched fibres will regain their former vigor. When the distention continues in full force for four or five days, the tone of the organ is liable to be destroyed for life; indeed, such cases often speedily terminate in death, even when the most urgent symptom has been relieved by the catheter. An instance in point occurred to me in a gentleman of sixty, who had labored under paralysis of the bladder, with complete retention, from Monday at twelve o'clock until nearly the same hour on Thursday night. I had no difficulty in passing the catheter; upwards of a quart of water was drawn off, and the patient felt himself immensely relieved in a few minutes. Notwithstanding he rested well during the remainder of the night, and had a good pulse when I took my leave of him in the morning after a late breakfast, he died early the following Saturday evening, in a state of complete exhaustion. No examination was made; but the probability was, as I learned from the attending physician, that there was partial gangrene of the suffering organ. When the paralysis depends upon

organic lesion of the brain or spinal cord, or upon permanent compression of the bladder or of the nerves which supply its tunics, it may generally be regarded as incurable. Recovery will be more probable in young than in old subjects, and in recent than in old cases.

It must be obvious that an affection depending upon so many and such opposite causes, must require, for its removal, a variety of modes of treatment. The first inquiry, in all cases, should, therefore, be, how has the malady been induced? Upon the proper solution of this question must necessarily hinge the success of our curative agents.

Two important indications are presented in every case of this disease; first, to draw off the urine, and secondly, to restore the tone of the muscular fibres of the affected organ. To fulfil the first, all that is necessary is to use the catheter. This should be done every six or eight hours, to prevent undue accumulation, and to compel the viscus to return, as it were, to its original habits. Carefully persevered in, this practice is frequently of itself sufficient, in a short time, to cure the malady. When complete paralysis of the abdominal muscles is associated with the vesical trouble, through which their assistance in emptying the viscus is lost, it may be necessary to favor expulsion by making pressure over the region occupied by the distended bladder. As this procedure, however, is objectionable, the difficulty may be obviated by attaching a piece of gum tubing to a catheter with a double curve, through which the action of a siphon is imitated. I generally prefer introducing the catheter every time it is necessary to draw off the urine to letting it remain in the bladder permanently; and as there is seldom any difficulty in doing this, the patient usually soon learns to perform the operation himself. Sometimes, however, the improvement is more rapid and decided when the catheter is constantly retained, and the water permitted to flow off every hour or two. I have found this practice particularly useful in cases of paralysis, attended with pain and spasm of the neck of the bladder, and a frequent desire to urinate. When the accumulation is very great, and has continued for several days, it is a good rule not to evacuate all the water at once, for fear of inducing severe depression from the sudden removal of the stimulus of distention. I have seen several cases in which I am

satisfied the patients lost their lives from inattention to this precaution. My own custom, under such circumstances, is not only to allow a small quantity of urine to remain, but to support the weakened organ by swathing the abdomen, precisely as after parturition, and tapping in ascites. When the catheter is permanently left in the bladder, it should be confined in the usual manner, and cleaned every other day; otherwise it will be certain to become incrustated with inspissated mucus, if not with earthy matter, and thus produce an injurious impression upon the affected organ.

Much harm is often done in this disease by the protracted employment of the catheter. The proper plan is always to discontinue it as soon as the organ has regained its expulsive power. The patient should be requested from time to time to try to evacuate the bladder by his own efforts, and if he is not able to effect the object completely, he should be assisted with the catheter; for the rule is, in all cases, to draw off every particle of water at least twice in the twenty-four hours. By employing the instrument too long, the organ becomes habituated to its use, and the cure will necessarily be more protracted.

The second indication, which is to impart tone to the bladder, or reanimate its exhausted energies, may be fulfilled in various ways. It has been already seen that the regular evacuation of the urine is sometimes of itself sufficient to answer this purpose; in general, however, it has to be aided by other means, both of a constitutional and a local character, and it is not always easy to determine which of these is entitled to the greater share of the credit.

Among the remedies which ought to be mentioned first are cathartics, which constitute a most valuable class of agents in nearly all cases of this disease, no matter what may be its exciting cause. A brisk cathartic, consisting of calomel and jalap, or calomel, and compound extract of colocynth, will often produce the most prompt and happy effect, not only ridding the alimentary canal, perhaps, of much vitiated and offensive matter, but improving the secretions, and rousing the energies of the whole system. The dose may be repeated every other day, until a decided amendment takes place, when it should be administered at longer intervals, and with a more sparing hand.

Emetics are sometimes of signal benefit in this disease. They

are particularly valuable where the paralysis is coincident with disorder of the digestive organs and torpor of the general system. They are contraindicated in the traumatic form of the disease, whether dependent upon direct injury, or indirectly upon injury of the brain and spinal cord.

After the bowels have been well evacuated, and the secretions restored, recourse may be had to remedies calculated to make a more direct impression upon the nervous system, if not upon the suffering organ itself. At the head of this class of agents may be placed strychnia, cantharides, and arnica. With the exception of the inflammatory form of the affection, there is hardly a case of vesical paralysis in which these remedies may not be employed with a fair prospect of benefiting the patient. They may be used either separately, or, as I generally prefer, in combination with each other. Given in this manner, their effect is usually more prompt and decided than when they are administered alone. An excellent formula is the twentieth of a grain of strychnia, the fourth of a grain of cantharides, and from three to five grains of the extract of arnica, three times in the twenty-four hours; care being taken to watch their effect, and to diminish or augment the quantity of the respective articles, as circumstances may seem to indicate. If spasmodic twitchings ensue, the patient suffer from strangury, or the stomach become irritable, they are to be regarded as an evidence that they have been carried far enough, that the dose should be modified, or that the offending substance should be temporarily suspended; to be resumed, if necessary, at another period. In paralysis of the bladder, consequent upon typhoid and other fevers, venereal excesses, and general exhaustion, few remedies are so serviceable as arnica, administered in the form of the tincture, in doses of from forty to sixty drops three times a day.

Strong testimony has been published in favor of ergot of rye in the treatment of this affection; and of its efficacy I can speak strongly from personal experience. A convenient mode of administration is the fluid extract, the dose being a drachm three times a day.

When the disease is associated with general debility, tonics are indicated, and often exert an excellent effect, both upon the system at large, and upon the urinary bladder. In general, a preference is conceded to the chalybeate preparations, of which

the best is the tincture of the chloride of iron, in doses of twenty drops every six or eight hours. It may be combined with strychnia, quinine, arnica, and other articles, if it be deemed necessary.

Counter irritation is a useful auxiliary to the other remedies. Indeed, there is scarcely any form of vesical paralysis in which it will not prove more or less advantageous. In rebellious cases, the actual cautery is a most powerful and suitable agent. The iron, which should be fully one inch in diameter, should be applied to the lower lumbar region, and the discharge be maintained, if necessary, for many weeks.

Another remedy of great potency, in many cases of this disease, is the cold douche. It is a most powerful stimulant, and sometimes rouses the dormant energies of the bladder when almost everything else has failed. The water should be poured from a pitcher held at a height of three or four feet, alternately upon the hypogastric region and the inferior portion of the spine, for a few minutes at a time, and the application should be immediately followed by frictions with a coarse dry towel until there is a perfect glow upon the surface. Sponging the loins, hips, and pubic region morning and evening with cold salt water, and rubbing them afterwards with a tolerably hard flesh-brush, has sometimes a happy effect. The same is true of injections of cold water into the rectum.

The local treatment of paralysis of the bladder should be directed to the restoration of the contractile power of its muscular fibres, on the same principle that artificial exercise is given to paralyzed muscles of other parts of the body. Long after the existing cause has apparently disappeared, the bladder often remains inactive in consequence of degeneration of its nervous and muscular elements. To induce artificial action, warm water, followed by cold, may be thrown into the viscus, alternating douches of different temperatures making a more powerful impression than cold injections alone. These means are especially called for when the disease is accompanied by cystorrhœa, but, under these circumstances, warm fluids alone should be employed.

Injections of strychnia are worthy of trial in this affection. In a very rebellious case, occurring in a man, sixty-eight years of age, who, after a drinking bout and exposure to cold, found himself unable to void his urine, every known method of treat-

ment had proved ineffectual. At the end of ten weeks, Dr. Lecluyse¹ dissolved six grains of strychnia, with a little alcohol, in a pint of water, and of this solution he injected into the bladder, previously emptied, two ounces four times a day. No effect was perceptible until about the end of the fifth day, when some urine appeared between the catheter, which had been retained in the bladder, and the urethra. The instrument being removed, the patient found that he had regained complete voluntary command over the organ; and from this time on he experienced no further inconvenience.

Dr. Tarbell,² of China, recently effected a cure by throwing into the bladder the one-sixteenth of a grain of the alkaloid in about four drachms of water, a copious voluntary flow of urine taking place after the third injection, or fourteen hours from the commencement of the use of the remedy. The case was one of paralysis from parturition, in which the catheter had been employed every twelve hours for twenty days.

Finally, electricity, in the form of galvanism or faradism, should not be neglected as a local stimulant. It may be applied directly to the bladder or externally. In the former method, an insulated conductor is introduced into the previously emptied viscus, and a weak current passed to an ordinary moistened sponge electrode applied over the lumbar spine, the perineum, or the hypogastrium, or to these points in succession. The application should not be continued longer than five minutes twice a day. In the indirect method, the negative reophore should be applied to the back of the head, and the positive to the suprapubic region, when there is reason to believe that the paralysis is due to disorder of the peduncles of the brain, as occurs in low fevers. When the affection depends upon disease of the lumbar portion of the spinal cord, the negative electrode is placed in that locality, while the positive one is applied to the hypogastrium. In local paralysis, or atony, both poles may be placed above the pubes. Faradisation of the full bladder sometimes answers a better purpose than when the organ is empty.

¹ *Annales de la Société d'Emulation de la Flandre Occidentale*, 1850.

² *Medical Record*, Nov. 13, 1875, p. 767.

CHAPTER IV.

INCONTINENCE OF URINE.

INCONTINENCE of urine, or enuresis, is most common in children and old persons; but it may occur at any period of life, and may be partial or complete, temporary or permanent. The water may pass off as fast as it is secreted, or it may be retained for a time, and then either dribble away, or be discharged in a full stream. It is in general a very distressing affection, for the constant discharge not only keeps the clothes wet, but it excoriates the genital organs and thighs, and thus leads to much suffering. The smell is also extremely offensive. It may be excited by a great variety of circumstances, the most prominent of which, however, are referable to external injury, or to inflammation, spasm, paralysis, or morbid sensibility of the bladder, or of this organ and the urethra, and organic changes in the prostate gland. Temporary enuresis is sometimes caused by mental emotions, such as fear and excitement, of which I have met with numerous examples in medical students who were about to undergo their examinations for the doctorate. It is also occasionally induced by gout or rheumatism. The affection may be feigned by soldiers to escape the performance of military duty; when the imposition may sometimes be detected by the threatened application of the actual cautery.¹

a. The best example of incontinence from external injury is afforded in lithotomy, the difficulty being most distressing in the day, while the person is in the erect posture. In this variety of enuresis, there is evidently partial loss of power of the muscular fibres at the neck of the bladder, associated with hyperæsthesia of the mucous membrane. A kick, blow, or fall upon the perineum is occasionally followed by the same result. In the female, the operation of lithotomy, or slow dilatation of the urethra, is extremely liable to be succeeded by incontinence; while in the male the passage of large bougies produces atony or relaxation

¹ Beck's Medical Jurisprudence, vol. i. p. 60, 1860.

of the vesical sphincter, and consequent dribbling. The affection often disappears spontaneously; or, on the other hand, it is sometimes incurable. The treatment must be conducted on general principles. Compression of the perineum with a spring truss is worthy of a trial.

6. Incontinence from inflammation, common or specific, of the bladder and urethra, and its effects, may depend upon various circumstances, as external injury, the extension of gonorrhœa, strong injections, calculus, prostatitis, stricture of the urethra, and syphilitic or tubercular ulceration, giving rise to loss of substance at the neck of the bladder. Mr. Langston Parker, of Birmingham, states that he has had one or two patients in whom an incurable incontinence of urine had been brought on by large doses of *copaiba*.¹ This variety of enuresis is very common in callous strictures, particularly of the membranous urethra, in which the fibres of its compressor muscle are converted into an inelastic structure, thereby depriving it of its function as an external sphincter. It is also a constant attendant of concentric hypertrophy of the bladder, a condition marked by a diminution of the capacity of the organ, and its consequent inability to retain more than a small quantity of urine. In many of the foregoing cases the escape is usually partial, and is almost constantly associated with spasm; while in others, the dribbling is constant. The treatment consists in removing the exciting cause. The catheter often affords instantaneous relief. When the discharge is troublesome, or incessant, the patient should wear a urinal.

7. Paralysis of the bladder, or of this viscus and the urethra, however induced, is a frequent cause of that false form of incontinence, which I have termed incontinence of retention. As this symptom is fully considered in the preceding chapter, it need only be mentioned at this time. To this class may be referred the incontinence which depends upon atony or relaxation of the sphincter muscle of the bladder, from spinal debility induced by masturbation, or inordinate sexual indulgence.

8. Incontinence may arise from hyperæsthesia of the neck of the bladder, or of the entire organ, or of the former locality and prostatic urethra, excited by a dense and acrid state of the urine,

¹ *Modern Treatment of Syphilitic Diseases*, 2d ed., London, 1855, p. 51.

or by sympathy with the kidney, rectum, anus, vagina, or uterus. In the early months of pregnancy, the woman is often tormented with a constant desire to urinate, and if the inclination be not instantly gratified, the water flows off involuntarily. Worms in the lower bowel, hemorrhoids, fissure of the anus, congenital phimosis, and contracted meatus, are often attended with enuresis. In all of these instances, the sensory nerves transmit the impression of a desire to urinate to the brain, whence it is carried back by the motor nerves, thereby inducing functional disturbance of the bladder, as indicated by involuntary contraction of its detrusor muscle. If the morbid sensibility be long continued, it is inevitably followed by atony of the vesical sphincter.

To this form of incontinence obviously belongs the nocturnal variety of the disease which occurs in young subjects. It is most common in delicate boys before the age of ten, and often begins much earlier. The discharge, which may take place twice or even thrice during the night, is sometimes effected under the influence of the will or a dream, but in general it is strictly involuntary. When it becomes habitual, as, in fact it usually does, it may last for years, and be even prolonged into advanced life, although in most cases it gradually disappears on the approach of adolescence. It is promoted by the use of fluids, by exposure to cold, and by sleeping on the back, a posture which is favorable to the accumulation of urine in the morbidly sensitive portion of the bladder.

The pathology of this affection consists, as has been already stated, in an exaltation of the natural sensibility of the mucous membrane of the neck of the bladder, unaccompanied, in many cases, by any appreciable change of structure. Sometimes there is slight thickening of the part, and occasionally the affected surface is somewhat inflamed. In protracted cases, there may be hypertrophy of the prostate gland, though never to any considerable extent. The sphincter of the bladder is easily relaxed, and yields to the most trifling impulse; hence the urine often flows off even when there is no fulness or distention of the organ.

Dr. Addinell Hewson has reported some interesting facts in relation to an epidemic of nocturnal incontinence, which occurred in 1857, in the Philadelphia House of Refuge. Of 78 boys, or nearly one-fourth of the entire number in the house, whose ages

ranged from seven to eighteen years, the average being thirteen, 63 were under constant observation ; 24 suffered from ascarides ; 20 labored under constipation ; 18 acknowledged masturbation ; some had herpes ; and many complained of disorder of the digestive organs. The urine deposited lithic acid in nearly one-half of the cases ; and the prepuce was elongated and discolored, either from frequent scratching or pulling, in 46 cases.

In the treatment of this form of incontinence, particular inquiry should be made into the nature of the exciting cause, the removal of which is of paramount importance. In that variety of the affection which is met with in boys and girls, the cure may be greatly expedited by proper attention to the diet, which should always be bland and unirritant. Late suppers are to be avoided, and the patient must abstain entirely from drinks for several hours before going to bed. During the day, he must be encouraged in the habit of retaining his urine as long as possible ; while during the night, he is to be awakened two or three times for the purpose of emptying his bladder, and this practice is to be persisted in for weeks and even months, until the disagreeable habit is broken up. During all this time, as well as, indeed, for a long period afterwards, the child should lie upon his side or belly, to prevent the urine from coming in contact with, and irritating the neck of the bladder. The internal remedies from which I have derived most benefit, are strychnia and cantharides, given three times a day, in the proportion of the fortieth, or thirtieth of a grain of the former to the twentieth of a grain of the latter, according to the age of the subject. A minute portion of opium forms a valuable addition ; and, in atonic cases, I often combine with these articles the tincture of the chloride of iron. When the strychnia disagrees, or fails to answer the purpose, the extract of *nux vomica* may be substituted for it. In either case, it is important to watch the effects of the remedy. I have great confidence in the use of cantharides in this affection, and have known it to afford relief when everything else seemed to prove unavailing. I prefer the powder to the tincture, and occasionally continue the exhibition of it until slight strangury is induced. During the last few years, chloral hydrate has been greatly extolled in cases of this kind. It certainly sometimes speedily arrests the complaint when everything else fails, and possesses remarkable controlling influence when

there is hyperæsthesia of the neck of the bladder. When the morbid sensibility is connected with inflammation, the balsam of copaiba, in doses of from five to ten drops every eight hours, is sometimes highly beneficial. In large doses, it is sure to irritate the stomach, and to disagree with the urinary organs. In this variety of the affection, a full anodyne at night, especially in the form of Dover's powder, often exerts a happy effect in controlling the discharge. As auxiliary measures, the cold shower-bath should be used once or twice a day, or cold water poured from a considerable height upon the lower portion of the spine, and blisters applied to the sacrolumbar region, the perineum, or the inside of the thighs. In obstinate cases, the neck of the bladder is cauterized, as in spermatorrhœa, but much more mildly, on account of the more tender age of the patient. In the female, the application is made to the orifice of the urethra.

Belladonna is regarded by many practitioners as a panacea in the incontinence of children; but my experience is altogether opposed to such a sweeping conclusion. It may be administered in the form of the extract, in doses varying from the sixteenth to the eighth of a grain, three times in the twenty-four hours, or in the form of the tincture, of which five to eight drops may be given at the same intervals. I have met with several rebellious cases in boys in which a permanent cure was effected by the daily hypodermic use of ten drops of the tincture. A steady persistence of the treatment for several months is necessary to insure a cure; and the effects of the remedy should be closely watched.

Sometimes great benefit results from the use of anodyne enemata and suppositories in this form of incontinence. They almost always afford temporary amelioration, but occasionally they promptly remove the disease after a failure of the more common means. Suppositories are, on the whole, more efficacious than injections, and they are also more liable to be retained; they therefore merit a decided preference.

The application of pressure to the urethra, gentle but steady, and gradually increased, has sometimes been found beneficial in removing this complaint, when it depends upon morbid sensibility of the urethra and neck of the bladder, especially where the more ordinary means have failed. When the tender surface is situated behind the scrotum, the probability is that the

pressure of a truss, resting upon the perineum, might be serviceable. The pad should be placed directly over the middle line, and should bear so firmly upon the parts as to occlude the urethra. A far better mode of opposing an obstacle to the flow of urine, however, is that devised by Dr. Corrigan, of Dublin. The preputial orifice is closed with collodion, which is easily removed with the finger-nail on the following morning, or whenever the child desires to empty his bladder.

In all cases of nocturnal incontinence, the practitioner must endeavor to secure the coöperation of the patient. The unhappy effects arising from a persistence of the habit must be fully pointed out; the child must be reasoned with, and even threatened with chastisement; the fear of punishment puts him on the alert, and induces him to keep a constant watch over the bladder. The patient, of course, is not beaten; nor does any sensible man ever think, at the present day, of tying up the penis; such a proceeding would be not less cruel than absurd.

4. Organic changes of the prostate may occasionally give rise to true enuresis. In that form of general hypertrophy of the gland, in which the median portion acts like a wedge, and separates the lateral lobes, the neck of the bladder is kept open, and the urine constantly trickles away. A similar effect is produced by senile atrophy of the organ, an entirely opposite condition, with associated atrophy of the sphincter of the bladder, through which there is no natural barrier to the free escape of the urine. The only relief in such cases is a urinal.

5. Incontinence, like retention of urine, is occasionally of a periodical nature, resembling, in this respect, an attack of intermittent fever, only that it is not preceded by chills, or followed by sweats. One of the best marked examples of this variety of the affection of which I have any knowledge, came under my observation, in a young man, twenty-two years of age, a bar-keeper in a coffee-house, of sanguine temperament, and perfectly regular habits. After having retired one evening, in his usual health, he was seized, while asleep, with a discharge of urine, which caused him to wet his bed, and which returned afterwards, with great regularity, every night, from one to three o'clock. The discharge occurred sometimes once, sometimes twice, and occasionally even thrice, during the night, waking him generally each time. In the day he never had any diffi-

culty, either in the recumbent or the erect posture. The urine appeared to be normal both in quantity and quality. The affection had existed for a fortnight, when he applied to me for relief. He had never suffered in this way before, and he could assign no reason for the present attack. His general health had all along been good, with the exception of slight derangement of the digestive organs; the appetite was excellent, and the bowels were perfectly regular. He was entirely free from pain, but complained occasionally of a sense of weight and uneasiness at the neck of the bladder.

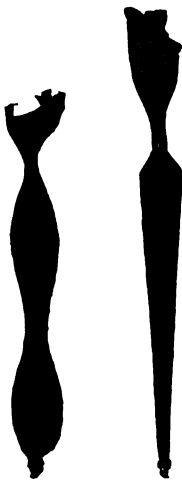
As his tongue was quite clean, I requested him merely to regulate his diet, to avoid all stimulating articles of food, and to take, every eight hours, seven grains of quinia, in union with the eighth of a grain of sulphate of morphia. He came back to me in four days, declaring that he was perfectly relieved, and that he had not had an attack of his complaint since his first visit. To guard against relapse, he was directed to continue

the treatment for several days longer, when he again reported himself well, nor did he have any other attack afterwards.

A very instructive case of this form of incontinence, associated with inflammation of the neck of the bladder, and unequivocally dependent upon a miasmatic cause, and relieved by quinia, is related by Dr. William M. Boling, in the *American Journal of the Medical Sciences*, for July, 1844.

Finally, when the incontinence is irremediable, the patient should wear a urinal, to prevent the fluid from soiling his clothes. The best contrivance for this purpose is a gum-elastic bag, adapted to the genitals and the inside of the leg, and provided with a metallic cap at its lower extremity for the purpose of evacuating the urine. The subjoined cuts will convey a better idea of the apparatus than any description, however elaborate. Fig. 11 represents the female, and fig. 12 the male urinal. It should be frequently washed for the sake of cleanliness, and every patient should be provided with an extra vessel, so that he may not suffer any inconvenience in case of accident.

Fig. 11. Fig. 12.



Female Urinal. Male Urinal.

CHAPTER V.

RETENTION OF URINE.

SECT. I.—SYMPTOMS, CAUSES, AND TREATMENT.

THE symptoms of retention of urine are generally well marked, even at an early stage of the complaint. In this respect, however, there is, as might be supposed, considerable diversity in different cases, depending mainly upon the natural tolerance of the bladder, and the character of the exciting cause of the disease. In paralysis of the muscular fibres of the organ, attended with loss of sensation, the accumulation may make great progress, and yet the individual not be aware of his real condition. A slight discharge of urine, perhaps, occasionally takes place; or if, as often happens, incontinence is soon superadded to the original disorder, the fluid dribbles off incessantly, and thus both patient and physician are lulled into a false security. When, on the contrary, the retention is inflammatory, more or less pain, and frequent inclination to void the urine, with inability to do so, attend the complaint, and at once expose its true character. In all cases, where suspicion points to the disease, a careful examination of the hypogastric region should be instituted, aided, if there be any obscurity, by the finger in the rectum or the vagina.

The tumor in the hypogastrium, formed by the distended bladder, fluctuates distinctly, especially when the retention is caused by paralysis; it is tender on pressure and percussion, and is not affected by change of posture. In old, thin persons, it may be the seat of transmitted pulsations, as in a case recorded by Mr. Druitt.¹ Pain frequently exists at a very early stage, and steadily increases until, in many instances, it becomes agonizing. In protracted cases, more especially in the inflammatory form of the affection, it is often accompanied with forcing, straining, or tenesmus at every attempt at micturition, and with rigors

¹ Cooper's Dictionary of Practical Surgery, 8th ed., 1861, vol. i. p. 4.

alternating with flushes of heat, thirst, and excessive restlessness; the patient tossing about in the wildest and most frightful manner. In the mean time, there is an urgent desire to void the urine, which is either not passed at all, or is discharged in gushes, jets, or drops, not in a full stream, or in any considerable quantity at a time. This symptom often sets in at an early stage of the complaint, and is apt to lead the unwary into error, by inducing the belief that the case is one of mere incontinence instead of retention. Such a mistake, unfortunately not uncommon, is often fatal to the poor sufferer; the proper means of relief are neglected, the accumulation progresses, and the bladder, distended to its utmost power of endurance, either mortifies or bursts; or death ensues from uremia. The fatal event, however induced, is generally preceded by a typhoid state of the system; a small, shattered pulse; cold, clammy sweats; pale and shrunken features; hiccup and twitching of the tendons; nausea, extreme restlessness, urinous perspiration, and profound coma.

During the progress of the retention, the distended bladder, by pressing on the rectum, impedes the exit of the feces, and leads to pain and fulness of the bowels. From the same cause, there is sometimes partial prolapse of the vagina, and, in both sexes, even of the rectum. When the tumor has reached its maximum development, it pushes up the diaphragm, and sensibly embarrasses the respiratory functions. The coats of the bladder, in the more severe forms of the affection, are attenuated, and, owing to the constant pressure which they experience, ultimately inflame, and are ready to give way under the accumulated suffering. In those who die, softened, ulcerated, or gangrenous patches are often observed; the orifices of the ureters are forced apart; and the urine, highly vitiated and offensive, fails to descend from the kidneys, or ceases to be secreted.

The period at which death occurs in this affection varies in different cases and under different circumstances. Most patients, if not relieved, perish in five or six days; a few before that time, and a few not until later. The immediate cause of death may be rupture of the bladder, with effusion of urine into the peritoneal cavity; exhaustion from mortification of the coats of the organ; or uremic poisoning.

When its mode of origin, its progress, and its symptoms, which are usually sufficiently characteristic, are considered, it is diffi-

cult to conceive how retention of urine could ever be mistaken for any other complaint. Yet, strange as it may appear, some very singular, as well as very unfortunate, blunders have occasionally been committed in this respect, and that too by men who, from their skill and experience, ought to have known better. The affection with which it is most liable to be confounded is ascites, or dropsy of the peritoneal cavity, and tapping has been advised, or actually performed, for its relief.

In ascites, the abdominal tumor is diffused, not circumscribed, and changes its form and situation with the position of the body; there is little, if any, tenderness on pressure and percussion; the sense of fluctuation is more distinct; the progress of the disease is more tardy; the urine, although more scanty than in health, is voided several times in the twenty-four hours, generally without pain or difficulty; there is commonly anasarca of the lower extremities; the skin is dry and harsh; and there is usually an absence of febrile disturbance, and always of typhomania and urinous odor. If any doubt exist, the introduction of the catheter will at once dispel it.

In advanced pregnancy, a trocar has been thrust across both walls of the bladder into the child's head, under the supposition that the disease was ascites. A distended bladder has also been mistaken for ovarian dropsy; and, on the other hand, dropsy has sometimes been mistaken for retention of urine. The elder Berard relates a case of the kind. The patient was supposed to be laboring under distention of the bladder; the catheter, as was conjectured, came in contact with a stricture, and was pushed on with so much violence as to pierce the bladder, followed by an escape of the ascitic fluid. The patient died, and the fact here stated was verified by the dissection of the body.¹

A distended bladder may be mistaken for a suprapubic abscess. Two such cases came under the observation of Colot;² and other examples of a similar nature have been reported by more recent writers. An error of an opposite character occasionally occurs, a pelvic abscess being mistaken for a distended bladder, as happened to Dr. George McClellan³ and Dr. Physick. A large,

¹ A. Berard, *Diagnosticque Chirurgicale*, 1836, p. 122.

² Belmas, *Traité de la Cystotomie Suspubienne*, p. 63.

³ *Principles and Practice of Surgery*, Phila. 1848, p. 135.

fluctuating tumor existed in the hypogastric region, which felt and looked precisely like an overdistended bladder, and was attended with all the symptoms of retention. The introduction of the catheter was followed, however, by only about half an ounce of urine. The finger, inserted into the rectum, came in contact with an apparently enormous enlargement of the base of the bladder, and fluctuation was elicited by counter-pressure above the pubes. The catheter was used again and again, with no better effect than in the first attempt. During the last operation, blood appeared in the eyes of the instrument, and the patient felt conscious, during its passage, that something had been torn. Finally, a trocar was plunged into the supposed vesical tumor above the pubes, and, to the astonishment of both surgeons, a large quantity of sero-purulent fluid escaped instead of urine. The man died in a few hours after the operation, and the dissection revealed the existence of a large abscess, which had evidently been caused by the lodgment of a date-stone, swallowed two years previously, in the vermiform process, and the contents of which had partially surrounded the bladder, extending upwards into the hypogastric region, and downwards into the pelvic cavity, where it compressed the rectum, and was mistaken for a distention of the fundus of the urinary reservoir. It appeared that the catheter, during its last introduction by Dr. Physick, had entered the orifice of the right ureter, the mucous lining of which was torn to a considerable extent, and elevated by the infiltration of the subjacent connective tissue, thus puffing up the parts like a blister.

A curious case of pericystic accumulation of fat, which formed a tumor in the hypogastrium, simulating in location, outline, and feel, a distended bladder, and giving rise to retention in a man, eighty-two years of age, has been recorded by Dr. Smith,¹ of Pittsfield. The organ was surrounded by an enormous mass of fat, by which it had been folded upon itself, through retro-flexion of its fundus, so as practically to consist of two cavities, the upper of which contained twelve ounces of fluid. During life the catheter could not be moved freely in the lower cavity, nor could its beak be carried to the base of the bladder. Only a little bloody urine was withdrawn.

¹ Boston Med. and Surg. Journal, July 18, 1867, p. 496.

The treatment of retention of urine is, in the first instance, by the catheter; since the indication is to relieve the organ with the least possible delay, before the part and the system have sustained serious mischief. When there is great distention, amounting to several quarts, it is best and safest, as a general rule, not to empty the bladder at a single operation, but gradually, drawing off a portion of its contents now, and another by and by. The catheter is introduced, and half the fluid is evacuated, to afford the overstretched fibres an opportunity of contracting and regaining their power. Some hours afterwards the instrument is again used, and the remainder of the urine is withdrawn. Under this practice, there is less risk of inflammation of the bladder and of general exhaustion. Where this precaution is neglected, the abdomen should be supported with a compress and a broad roller, as after tapping and parturition. A point of the last importance is not to relieve the bladder when the patient, especially if he is old or infirm, is in the erect posture. From a want of attention to this precaution, death from sudden syncope has been known to occur. A large opiate should also be exhibited just before, or immediately after, the operation, premising, of course, that there is no contraindication on account of cerebral oppression.

Retention of urine may be produced, first, by mechanical and pathological obstruction; secondly, by paralysis; thirdly, by spasm; fourthly, by inflammation; fifthly, by pelvic tumors; sixthly, by certain conditions of the uterus and female genital organs; seventhly, by distention of the rectum; eighthly, by hysteria and deficient volition; and, ninthly, by the effects of miasm.

1. The first class of causes may affect the penis and prepuce, the urethra, or the bladder.

- a. Retention of urine may depend upon priapism, induced by inflammation, and the consequent effusion of lymph in the cavernous bodies, by lesion of the cerebro-spinal axis, or by the injudicious use of cantharides. For its relief, recourse is at once had to the catheter, attention being afterwards paid to the removal of the exciting cause.

The obstruction may be occasioned by an imperforate prepuce. Many years ago I met with an instance of this kind, in an infant two days old, in which the foreskin was distended into a pellucid,

fluctuating tumor, nearly as large as a pullet's egg. The little patient was in great pain, but was instantly relieved by a free incision, which was followed by at least four ounces of urine.

β. The urethra may be obstructed by congenital occlusion, a polypoid or papillary growth, a calculus, clotted blood, false membrane, inspissated mucus, periurethral deposits and lesions, organic stricture, and hypertrophy, or other diseased conditions of the prostate gland. A catheter, bougie, or other foreign body may break off in the canal, and thus become an impediment to the egress of the urine.

Retention occasioned by congenital occlusion is almost always easily remedied by the knife and catheter, the use of which should be continued until the parts are fully cicatrized, lest they should reunite, and thus occasion a recurrence of the difficulty. Tumors are removed by excision, avulsion, or caustic applications. An impacted calculus may generally be pushed back into the bladder, or extracted with the forceps; or, when these means fail, be removed by external incision. Pieces of bougie or catheter, or other foreign bodies, are managed upon the same principles. Clotted blood, false membrane, and inspissated mucus are easily displaced by the catheter, or dislodged by the syringe, or forced out by the urine.

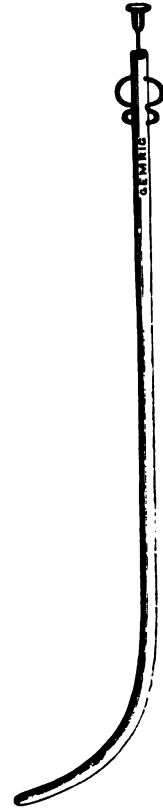
The obstacle may lie exterior to the urethra, and the consequences be the same as when it exists internally, as is witnessed in abscess of the perineum, deep-seated collections of blood, an effusion of lymph, or a malignant tumor. Carcinoma of the penis, in its progress towards the bladder, contusions of the perineum, and extravasation of urine are frequently followed by the worst forms of retention.

When the obstruction is seated externally, and bulges inwards, so as to occlude the canal, the knife supersedes the catheter, the use of which would be productive of much pain, especially in a perineal abscess. The parts are freely divided from without; the swelling is instantly removed, and the urine is enabled to flow along the natural channel. When the obstruction is produced by extravasated blood, in consequence of a fall or kick, its absorption is promoted by the application of acetate of lead, hydrochlorate of ammonia, or spiritous embrocations. In retention from malignant disease of the penis, the bladder is relieved by puncture. In contusions of the perineum without rupture of

the urethra, the catheter is used; but when the accident is attended by laceration, a large incision is made, to save the tissues from urinary infiltration.

In organic stricture, relief is generally obtained by carrying a silver catheter down to the seat of the obstruction, when, by making slow and steady but firm pressure, the impediment is overcome, especially if the patient be under the influence of chloroform. Should the passage of even the smallest sized catheter be impracticable, recourse is had to the probe-pointed, filiform whalebone bougie, which may be insinuated through the coarctation, when the tunnelled catheter of Dr. Gouley, shown in fig. 13, may be passed over it into the bladder and the urine evacuated. In cases of this nature, I deem it advisable, before removing the whalebone guide, to use it as a conductor for a tunnelled divulsor or urethrotome, through which the stricture may be split or incised, and future risks be obviated. Should the bladder not be entered, after patient trial with instruments, a small wax bougie, armed with a bit of potassa fusa, may be passed down to, and firmly pressed against, the stricture. In this way, Mr. Parker,¹ of Birmingham, succeeded in promptly relieving two cases. In the event of the failure of these means, the only resources are perineal urethrotomy, aspiration, or puncture of the bladder, which are described at the end of this chapter, or tapping the membranous urethra behind the seat of the obstruction. This operation, which is as simple as it is effectual, was first practised by Mr. Molins, of London, in 1652, and is especially adapted to cases of retention from impassable stricture seated in front of the curved urethra. The patient being placed in the lithotomy position, and the tip of the left index-finger being lodged at the apex of the prostate gland, with the anterior wall of the rectum intervening, as represented in fig. 14, from Bryant, a straight or slightly curved

Fig. 13.

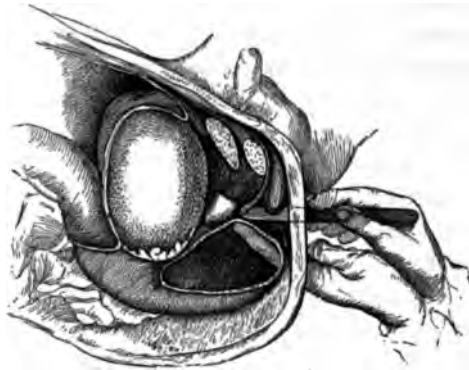


Gouley's Tunnelled Catheter.

¹ British Medical Journal, May 2, 1859, p. 400.

bistoury, with its back directed towards the bowel, is entered at the median raphé, five lines in front of the anus, and pushed steadily upwards, as if to strike the pulp of the finger, which

Fig. 14.



Tapping the Urethra in the Perineum.

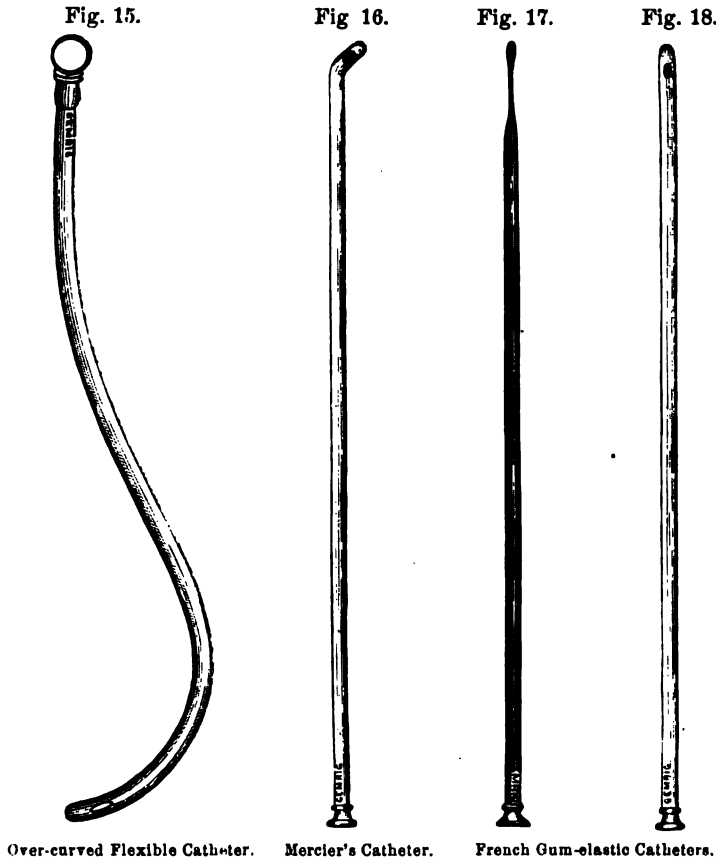
serves to guide it into the membranous urethra, which is then opened, along with the apex of the prostate, as the knife is withdrawn, when the external wound is simultaneously enlarged. The subsequent retention of a canula in the bladder is entirely unnecessary.

The most common form of obstruction of the urethra and neck of the bladder, productive of retention of urine, is hypertrophy of the prostate gland. The enlargement may involve the entire organ, or it may be limited to one of its lateral lobes, or even to its median portion. In most cases, all these parts are affected simultaneously, though not to the same extent. A very distressing and intractable form of retention of urine is occasionally produced by the median portion, or, as it is more commonly called, the third lobe of the prostate, which is often many times larger than in the healthy state, constituting a thick, mammillated body, which closes the vesical orifice of the urethra like a valve. Whatever may be the form of enlargement, it is usually attended with certain alterations in the shape, size, and direction of the prostatic urethra, which may be narrowed, greatly lengthened, deflected to one side or the other, tortuous, curved directly upwards, or form a more or less decided angle. These deviations from the normal condition serve to explain the difficulties encountered in the passage of the ordinary catheter.

Retention of urine, dependent upon enlargement of the prostate, is usually of a temporary character, but is liable to be reproduced by the slightest exposure to cold, by irregularity of diet, by horseback exercise, sexual indulgence, or neglect to empty the bladder. During the attack, as well as for some time after, the urine is loaded with thick, tenacious mucus, and exhales an offensive ammoniacal odor, the calls to micturition are frequent and urgent, there is scalding in the urethra, with a sense of weight or throbbing in the perineum, and the patient often suffers indescribable torments. In protracted cases, the retention is apt to be attended with incontinence, and the organ is rarely entirely emptied without instrumental aid.

The treatment is by the catheter; and one of silver is far preferable to the flexible English instrument, especially when the gland is greatly enlarged. It should be at least twelve inches in length from the beak to its rings, and its curve should form an arc equal to one-third of the circumference of a circle five inches and a half in diameter. When it comes in contact with the enlarged gland, instead of forcing it onward, the surgeon introduces the left index-finger into the rectum, and placing it against the beak, he guides it into the bladder, by tilting it gently towards one side or upwards towards the pubes, at the same time that he urges the handle on with the right hand. In very old men, with inordinate hypertrophy of the gland and great lengthening of the included urethra, the silver instrument may be advantageously replaced by a flexible catheter, from twelve to fifteen inches in length, which has been kept on an over-curved stylet, as represented in fig. 15, so as to insure a good curve to the beak, whereby it is enabled to pass the more readily over the obstruction. The soft, elastic, angular catheter of Mercier, represented in fig. 16, is invaluable when the urethra forms an angle in consequence of enlargement of the middle lobe; and it is well adapted to cases in which false passages have been made, since, during its introduction, the beak is always in contact with the roof of the urethra. When the canal is deflected to one side, the soft, pliable French instruments, represented in figs. 17, 18, will often follow the changed relations of the canal, when stiff catheters fail. The vulcanized India-rubber catheter, unprovided with a bulbous end, is intro-

duced by a succession of short jerks. These instruments are invaluable in the treatment of prostatic hypertrophy, and no



surgeon should be without them. Dr. Squire, of Elmira, has devised a vertebrated catheter, the vesical extremity of which is composed of a series of caps, united by a linked wire, an arrangement which admits of its easy introduction and the removal of the residual urine which is dammed in by the enlarged prostate.

To fulfil the same indications, Dr. S. W. Gross employs the silver instrument, represented in fig. 19. The beak, which is three-fourths of an inch in length, and bent at an angle of 100° , through which it resembles the catheter of Mercier, is united to the shaft by means of a closely wound coil of silver wire, a mode

of imparting flexibility to metallic instruments, for which the profession is indebted to Dr. R. J. Levis, of this city. After

Fig. 19.



Gross's Prostatic Catheter.

passing the obstruction, by reversing the beak, the residual urine readily drains away. The fault of catheters of large curve is their inability to reach the cavity behind the enlarged gland.

Should it be impossible to relieve the retention with the catheter, other measures will have to be resorted to; but as these are discussed in the chapter on Hypertrophy of the Prostate, it is unnecessary to describe them at this time.

When the enlargement of the prostate is associated with inflammatory symptoms, as it occasionally is when it is dependent upon engorgement rather than upon true hypertrophy, the treatment is by antiphlogistics, such as bleeding, leeching, antimonials, the hot hip-bath, and anodyne enemata. Undue distention is relieved by the bulbed soft catheter, of the calibre of 8 or 10 of the French scale. In retention from abscess, when the swelling projects into the urethra, a conical silver instrument is preferable, as it not only admits of opening the collection of pus, but of the evacuation of the urine.

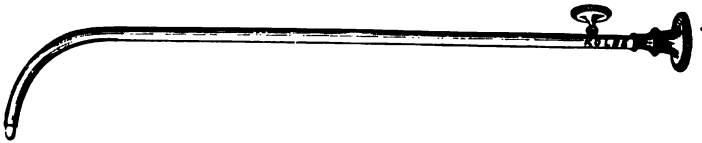
7. In the third place, the obstruction may be seated in the bladder. Of this class of causes the most frequent are, coagulated blood, calculous concretions, false membranes, tenacious mucus, and neoplasms.

Retention from coagulated blood is often a very serious affair, since the fluid, however furnished, soon coagulates, and thus offers a barrier to the escape of urine. Its presence may be suspected if, in the absence of previous urinary disease, retention follows contusion of the perineum or hypogastrium, and the withdrawal of the catheter is attended by the flow of a few drops. It sometimes complicates the existence of highly vascular morbid growths, when its diagnosis is easy. Unless the symptoms are urgent, nothing need be done save to relieve the

frequent desire to urinate by full doses of opium. When the effusion is recent, the introduction of an instrument can do no good, since its eyes become plugged by the blood, thereby preventing the passage of the urine. The beneficial effects of delay, under such circumstances, are often very striking. In an old gentleman, seventy-two years of age, whom I saw some years ago with Dr. Pirtle, the distended bladder formed a large tumor above the pubes, but not a drop of urine followed the use of the catheter. Eighteen hours subsequently, almost a quart of nearly clear fluid was drawn off. The blood had, in the interval, evidently subsided to the bottom of the bladder, and thus allowed the urine to act the part of a supernatant fluid.

When the hemorrhage is due to regurgitation from injury inflicted upon the posterior portion of the urethra by the introduction of instruments, or other traumatic causes, evacuation should be attempted with a large silver catheter, the orifice of which is completely occluded with an obturator attached to a stylet, removed the moment the instrument reaches the bladder. Such an instrument, which I had constructed many years ago, and which I have often used with an admirable effect, is represented in fig. 20.

Fig. 20.



Blood Catheter.

In some cases, the bladder may be distended to such a degree as to imperil life from rupture of the organ or suppression of urine. In such an event, the clot should be broken down by a large silver catheter, aided by injections of cold water, or, what is still better, water and vinegar, and an exhausting syringe, or Clover's evacuating apparatus for lithotomy. It may even be necessary, in exceptional instances, to resort to suprapubic or perineal cystotomy.

Retention, caused by calculous concretions, tumors, ropy mucus, or false membrane, is, in general, easily relieved by the catheter, and does not, therefore, require special consideration.

II. Retention of urine from atony or paralysis of the muscular

fibres of the bladder is of common occurrence; but as its causes and treatment have already been pointed out in Chapter III., its consideration, in this connection, may be dismissed. The liability of this variety of retention, however, to be followed by incontinence cannot be too forcibly or too frequently impressed upon the mind of the practitioner.

III. Retention of urine from spasm of the neck of the bladder, or of the urethra, constituting, when the latter locality is affected, spasmodic stricture of the urethra, is commonly produced by cold, by suppression of the cutaneous perspiration, and by the use of alcoholic drinks, in persons suffering from slight inflammation of the curved urethra. The remitting pains, the violent straining, and the frequent desire to urinate, clearly indicate the nature of the complaint. The proper treatment is indicated at page 79. When it is due to reflected irritation, the removal of its exciting cause suffices for a cure.

IV. Retention may be produced by inflammation of the neck of the bladder, or of this organ and of the urethra, when it is usually associated with spasm. The symptoms are, a frequent desire to urinate, with an inability to pass more than a few drops of water at a time; a sense of smarting, burning, or scalding, in the urethra and the head of the penis; violent straining; a feeling of weight about the anus; and throbbing in the perineum. Occasionally the urine is mixed with blood or pus.

The treatment is antiphlogistic. Perfect recumbency is enjoined; general or local bloodletting may be necessary; the bowels are moved by mild laxatives; the patient is placed in a warm bath; and spasm is allayed by anodyne enemata and the exhibition of chloroform. When the symptoms are urgent, and the means here indicated are ineffectual, a soft catheter must be used, but not without the greatest care and gentleness.

V. Retention of urine may, in the fifth place, depend upon the presence of a pelvic tumor. Of this class of causes, several varieties may be enumerated.

a. The difficulty may arise from cysts between the bladder and the rectum, which compress the neck of the former viscus. Instructive examples of serous cysts have been furnished by Lesauvage, Spence, and Smith. Hydatid cysts have been met with by White, Maunder, Farre, Spence, Bryant, Prieger, and James; and a cyst, which contained two pints of an oily fluid,

has been reported by Pretty. The case occurred in a man, twenty-four years of age, and the peculiar fluid was probably due to a degenerated congenital dermoid tumor. In all of these instances a swelling was felt through the rectum and the belly; and in all, save one, in which Mr. Bryant opened the cyst through the perineum, relief was afforded by rectal puncture.

β. The neck of the bladder may be compressed by an exostosis of the pelvic bone, whereby it is rendered unable to void its contents. In an example of this description Boyer was unable to introduce a catheter.

γ. Retention may arise from a displaced kidney. Of this occurrence, a remarkable and unique instance is recorded by Professor Gouley.¹ A man, twenty-four years of age, suffering with symptoms of retention, was subjected to rectal puncture, after failure with the catheter, with the effect of the escape of a little urine. Three days subsequently, eight ounces of fluid were drawn off in the usual way; but without making any impression on the hypogastric tumor, which felt like a distended bladder. On death from peritonitis, a single kidney, the pelvis of which was enormously dilated and filled with urine, was found to occupy the pelvis behind the bladder. Not only was there retention of urine in that viscus, but also in the pelvis of the kidney, the latter of which had been produced by compression of the short ureter, partly by the kidney, and partly by the bladder.

VI. Certain conditions of the uterus and of the female genital organs are liable to be attended with retention of urine. In the female, retention is rarely met with in connection with affections of the urinary organs; but is generally due to some mechanical condition of the pelvic organs, though while the urethra is compressed against the subpubic ligament, or materially changed in its form and direction. Of the causes inherent in the uterus the most common and important are, prolapse, retroversion or retroflexion, tumors in its walls or cavity, and hematometra. Among the periuterine causes may be mentioned pelvic hematocoele, pelvic abscess, and cellulitis, pelvic peritonitis, and tumors of the ovary, broad ligament, and Fallopian tube. Neoplasms, abscesses, and prolapse of the walls of the vagina; dependent uterine polyps; retained menses, from imperforate hymen, are so many causes of retention. It occasionally takes place during

¹ Diseases of the Urinary Organs, p. 235, New York, 1873.

uterogestation, from the pressure which the womb exerts upon the bladder. The accident is liable to happen, chiefly, either a short time before the occurrence of quickening, or during the last three months of pregnancy. Distention of the bladder also sometimes occurs during parturition, when it is particularly to be dreaded, as it has occasionally been followed by laceration of its coats, and the escape of urine into the peritoneal cavity. A full bladder, as previously mentioned, may also be a cause of postpartum hemorrhage.

The treatment of retention from so many and such varied conditions cannot, of course, be dwelt upon. Displacements must be remedied; abscesses and collections of blood be evacuated; and tumors removed. When the symptoms are urgent, the catheter must be employed. In many cases, the common female catheter is unavailing, on account of its small curve, and the impossibility of carrying it up behind the pubic symphysis, or in the direction taken by the displaced urethra. On this account a male instrument, or the French elastic catheter are to be preferred. In prolapse of the uterus, a pouch which is below the level of the urethra is frequently formed by the dragged down portion of the bladder connected with the neck of the organ. In this pouch the urine accumulates, and may give rise to cystitis, unless it be evacuated.

VII. Inordinate distention of the rectum may be mentioned as another cause of retention of urine. The obstruction may proceed from excessive accumulation of feces, or from the impaction of a large quantity of undigested food or foreign bodies. Some years ago, a man, aged sixty, was brought to King's College Hospital, London,¹ with retention of urine, caused by the lodgment in the rectum of upwards of a pint of common gray peas, which had been swallowed, in a dry state and almost without mastication, six days previously. They had undergone no change in the stomach, but, in their transit through the bowel, they had become swollen by the absorption of moisture, and the greater number had accumulated in the rectum, where they formed a solid mass which occupied almost the entire pelvic cavity, and which, by compressing the urethra and the neck of the bladder, had effectually prevented the discharge of the urine. It was with no little difficulty that a catheter could be introduced after

¹ Dr. Geo. Johnson, London Medical Gazette, vol. xxx. p. 605.

death. Dr. W. H. Westcott, of Massachusetts, recently reported a case of retention of urine, in a boy eight years old, caused by lodgment in the rectum of upwards of six ounces of cherry-stones. The excessive distension of the bowel prevented the passage of the catheter.

The proper remedy for this form of retention is clearance of the rectum by means of the scoop, spoon, or forceps, according to the nature of the obstructing substance, aided, if necessary, by stimulating or oleaginous injections. The catheter is used if it is required.

VIII. There is a variety of retention of urine which is occasionally met with in hysterical females, and which seems to be dependent rather upon a deficiency of volition than upon paralysis of the muscular fibres of the bladder. The patient cannot, or thinks she cannot, urinate, and, therefore, does not try to relieve herself. The affection is, in general, only temporary, but may last for several days, weeks, or even years. Purgatives, assa-fœtida clysters, and the internal use of chloral and bromide of potassium, and iron, are the remedies mainly to be relied upon. Cold water, poured upon the sacrolumbar region in a continuous stream, from a height of three or four feet, often affords speedy relief. The catheter must, if possible, be avoided, and in all instances, especially when there is reason to believe that the complaint is feigned, it is of great importance not to encourage the patient by an appearance of commiseration. In a case, under my charge some years ago, the affection had persisted for upwards of four months, during which period the urine was drawn off twice every twenty-four hours. The application of a large blister to the sacrolumbar region, and threats to employ the actual cautery, were finally followed by complete recovery.

A form of retention, dependent upon deficient volition, is sometimes met with in the male. In the case of one of my patients, of rather delicate constitution, and a nervous, melancholic temperament, the attacks were produced by close study, mental anxiety, and physical exhaustion, and were liable to be greatly influenced by mental emotion. Whenever he travels, his mind always becomes deeply absorbed by his ailments; he fancies that he will be unable to pass his urine, and the consequence is that, when he makes the effort, he utterly fails, no matter how powerfully he may exert himself. As soon, how-

ever, as he goes to some retired place, he can relieve himself with the greatest facility. He has tried this experiment repeatedly, and always with the same result.

It is to this form of retention of urine that Sir James Paget has applied the term "stammering of the bladder," to which allusion has already been made at page 57. In consequence of a disturbance of coördination between the sympathetic and motor nerves distributed to the bladder, there is a want of consentaneous action between the detrusor and sphincter muscles, and a species of temporary paralysis results. In a case of this description, occurring in a girl, eighteen years of age, Professor Richardson,¹ of New Orleans, afforded prompt relief by dividing the upper wall of the urethra in its entire extent, whereby its muscular fibres were placed in a state of rest.

IX. Finally, there is a form of retention of urine, which may be said to be periodical in its character, as it comes on at a particular time, very much like an attack of intermittent fever, being evidently dependent upon similar causes. The retention occurs at a certain period of the day, and, after having continued for some hours, it either disappears spontaneously, the bladder gradually regaining its expulsive power, or, as perhaps more commonly happens, relief is obliged to be afforded with the catheter. The organ then recovers its natural tone, and retains it until the time arrives for another attack, which usually happens about the same period every other day, thus bearing the closest resemblance to a tertian ague. There can be no doubt that the immediate cause of this affection is malaria, the effects of which explode upon the muscular fibres of the bladder, temporarily irritating and paralyzing them, and thus disqualifying them for the discharge of their proper functions. The treatment must, of course, be by quinine, either alone or in union with arsenic and other antiperiodic remedies; the bowels and secretions must receive due attention; and the distended bladder must be promptly evacuated with the catheter.

SECT. II.—CATHETERISM.

The introduction of the metallic catheter, although apparently very simple, is one of the nicest and most delicate processes in

¹ New Orleans Journal of Medicine, Oct. 1869, p. 686.

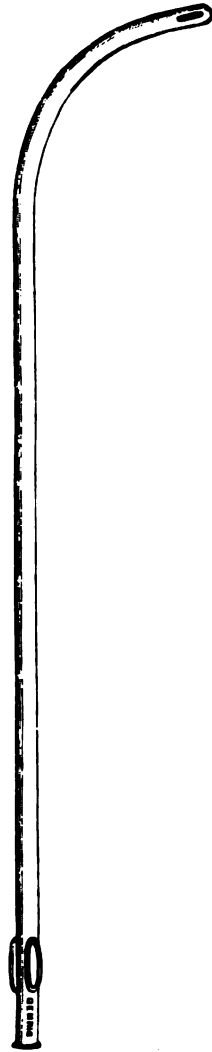
surgery. It requires skill of the highest order, as well as the most intimate knowledge of the anatomy of the urinary organs. If I were called upon to state what I considered as the most important operation that a practitioner is obliged to perform, I should unhesitatingly say the introduction of the catheter. It is true, the most untutored and awkward surgeon may occasionally, nay, perhaps not unfrequently, reach the bladder without difficulty; but let such an individual attempt the passage of the instrument when there is some mechanical obstacle, as a stricture or an enlarged prostate, or spasmodic contraction of the muscular fibres of the urethra, and he will be sure to be foiled. The moment the catheter is arrested he becomes bewildered; his hand trembles, dismay is depicted in every feature, large drops of sweat stand upon his brow, and his whole frame is paralyzed. If, under these circumstances, he proceed, he will almost inevitably produce a false passage, and occasion the consulting surgeon some difficulty in overcoming it; if, indeed, he does not actually endanger the life of his patient. To avoid such an occurrence, as disgraceful as it is unfortunate, the introduction of metallic instruments should alone be entrusted to skilled practitioners.

Catheters are cylindrical tubes, varying in their composition, size, and shape. The best are made of silver, and are, for an adult, about nine inches and a half long, by six or seven millimetres in diameter; they are perfectly smooth, light, and bent at the vesical extremity to accommodate them to the natural curve of the fixed urethra, which, as originally pointed out by Mr. Briggs, of London, corresponds to rather less than one-third of the circumference of a circle three inches and a quarter in diameter, or an arc of such a circle subtended by a chord two inches and three-quarters long. An instrument, usually known as that of Sir Henry Thompson, the axis of the point of which forms a right angle with the axis of the shaft, fashioned to this curve, will generally pass through the average urethra without the slightest difficulty. A catheter, constructed on these principles, is represented on a scale of one-half its actual size in fig. 21. In children and adults below the average stature, the curve should describe an arc of a smaller circle; while in corpulent persons it should form a segment of a larger circle. The vesical extremity, or beak, which is rounded off, but closed, is provided with a

smoothly bevelled ovoidal opening on each side, three lines long and a line in width, for the entrance of the urine. The other extremity, usually called the handle, is open, and is furnished with two rings, which serve the double purpose of enabling the surgeon to judge of the exact position of the beak when it is buried out of sight, and of securing it in its place when it is necessary to retain it in the bladder. The flexible English catheter, if used with a stylet, possesses no advantages over the silver instrument; but it will retain any curve that the surgeon may desire to give it, by moulding in hot and immediately transferring it to cold water. The French elastic instruments, shown in figs. 17 and 18, are perfectly soft and flexible, and are so easy of introduction, and so utterly incapable of doing harm, that they may be entrusted to the patient or his nurse. These contrivances cannot be too warmly recommended to inexperienced practitioners; but their cost and liability to crack, it is feared, will prevent their general adoption in this country. Every surgeon should have an assortment of catheters, of different composition and dimensions, in order that he may be prepared for any emergency. The straight metallic catheter, although easily introduced, is not much in vogue.

When the urethra is entirely sound, a tolerably large catheter, one that will gently distend the parietes of the tube, is selected. An instrument of this size will, in general, glide along much more easily than a smaller one, since it is not so liable to be arrested by the folds and follicles of the mucous membrane, or to impinge against the margins of the opening in the triangular ligament. Before introducing it, it should always be well oiled, and carefully warmed by rubbing it between the thumb and fingers, or by plunging it into hot water.

Fig. 21.



Silver Catheter.

The catheter may be introduced while the patient is standing, sitting, or lying; but, whatever posture may be selected, it is important that the thighs should be moderately separated from each other, and flexed upon the pelvis, to relax the abdominal muscles. In the first case, the patient leans with his nates against the wall, advances and separates his feet a few inches, and inclines his chest slightly forwards, so that he may not change his position during the operation. The surgeon may take his place either at the front or side. If he sit, the breech should project over the chair, and the body be directed backwards. The position of the operator is the same as before. The most convenient posture, however, is the recumbent. The patient lies on his back, near the edge of the bed, the head being supported by a pillow, and the knees, slightly separated from each other, somewhat raised. The surgeon, standing by the left side of the bed, takes the penis in the left hand, and lifts it to a right angle with the body, to efface the curve which it forms at the pubes. The catheter, held in the right hand, between the thumb and first two fingers, is inserted into the orifice of the urethra, its concavity being directed towards the pubes, and the handle being nearly in contact with the median line of the abdomen. The instrument is now passed onward, until its beak reaches the sinus of the bulb, which lies upon the anterior surface of the triangular ligament, rather deep in the perineum. To disengage it from this depression, the handle is changed from the horizontal direction, in which it has hitherto been held, into the vertical, at the same time that the point is slightly retracted. By this manœuvre, the curved portion is brought under the arch of the pubes, and immediately opposite the opening in the triangular ligament. By depressing now the handle of the instrument on a level with the thighs, or, rather, a little between them, its beak glides readily over the prostatic part of the urethra into the bladder.

In performing this operation, no force is employed; on the contrary, the whole proceeding is conducted with the utmost gentleness. The catheter, held as lightly as possible, is made to glide along, as it were, by its own weight and by that of the hand. The penis should be drawn slightly forward over the instrument, just sufficiently to render the urethra a little tense. Everything like stretching and pulling must be avoided.

In introducing the straight catheter, the patient lies on his back, and the surgeon stands on the right side of the bed, instead of on the left, as in the other case. The penis is held in the left hand, at a right angle with the body, and the instrument is carried down perpendicularly as far as the sinus of the bulb. To free it from this depression, the point is retracted two or three lines, and then, while the penis is lowered between the thighs, it is at once pushed onward into the bladder.

The natural obstacles to the passage of the catheter are the lacuna magna, the sinus of the bulb, and the margins of the opening in the triangular ligament. The first is easily avoided by using a large instrument with a rounded instead of a conical point; the second, by withdrawing it two or three lines before it is pushed on; and the last, by carrying it parallel with the raphé of the perineum, and not more than an inch below the arch of the pubes. The orifices of the prostatic and seminal ducts, the sinus pocularis, and the gallinaginous crest, can hardly be considered as offering any opposition to the progress of the instrument. When the prostate gland is enlarged, the finger, introduced into the rectum, will enable the surgeon to push the catheter forward toward the pubes, or toward either side, as circumstances may require.

Difficulty is occasionally experienced in entering an instrument at the external meatus. I have repeatedly encountered this impediment, both in ordinary catheterism, in sounding, and in lithotomy. In general, it is produced by an unusually narrow orifice, attended with very hard, tight edges, evincing but little disposition to dilate; sometimes it is caused by a hypospadiac condition of the part; and in some instances, again, it is dependent upon a very narrow opening in the prepuce, the result either of disease or of a congenital vice. The impediment may also arise from a very long and bulky foreskin, especially if there be at the same time an uncommonly small orifice. In such a case, as I have had occasion to witness more than once, the point of the instrument, instead of entering the meatus, will be very apt to pass between the head of the penis and its preputial investment.

The proper remedy in most of these cases is incision; a narrow bistoury being introduced, the faulty orifice is enlarged to the requisite extent, after which it is permitted to heal over a tent, confined by a narrow adhesive strip, and retained until the object

is attained. If the obstacle is occasioned by a long and narrow prepuce, relief is attempted by means of a narrow, slender bivalve speculum, with which the parts are gently but effectually dilated; or, this failing, the redundant structures are split open, or cleft and ablated, as in the operation of circumcision.

Various contrivances are used for retaining the catheter in the bladder. The one which I usually prefer consists of a double T-

Fig. 22.



Mode of securing the
Gum Catheter in the
Bladder.

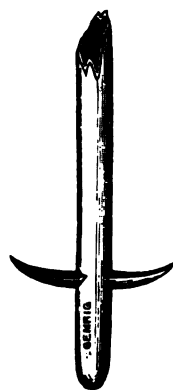
bandage, the two thigh-pieces of which are fastened, so as not to interfere with the anus and the scrotum. The instrument, having been introduced, is secured by two strips of linen, or tape, by tying the middle of each to the ring of the catheter, and the ends to the vertical bands. Another very good plan is to surround the penis with an ivory, elastic, or linen yoke, and to secure this against the pubes by means of four pieces of tape, carried round the thighs and pelvis. The catheter is then fastened to the ring or yoke in the usual manner.

For retaining the soft gum catheter, by far the best device is that represented in fig. 22. It is of French manufacture, and is composed of bands of gum elastic, whereby it is rendered incapable of injuring the penis, in the event of an erection. The opening at the point of crossing of the bands holds the instrument very securely.

It is not to be forgotten that a catheter, if allowed to remain too long in the bladder, or if improperly lodged in this organ, may cause very serious, if not fatal injury. When the instrument is introduced too far, or retained too forcibly, its extremity must necessarily exert undue pressure upon the mucous membrane, and through it upon the other tunics, followed, if it be not speedily moderated, by sloughing and perforation, and eventually by the escape of the urine into the peritoneal cavity, or into the surrounding connective tissue. In the former case, the accident is always necessarily

fatal, and in the latter it is very apt to become so, either soon after its occurrence, or at an indefinite period. One great fault which most practitioners commit when they have occasion to retain a catheter in the bladder, is that they employ too long a one, and a second, and not less serious one, that they retain it too long in one position. To answer the purpose, the instrument should be at least from an inch to an inch and a half shorter than one used for merely drawing off the urine, and its beak should rest just within the vesical orifice of the urethra. What is called Symes' catheter is by far the most suitable of the metallic instruments for permanent retention; while the blunt French elastic instrument is the best of the soft ones. The winged or self-retaining catheter of Mr. Holt, represented in fig. 23, can never come into general use, on account of the irritation it is liable to set up, and its frequent failure to answer the purpose for which it is intended.

Fig. 23.



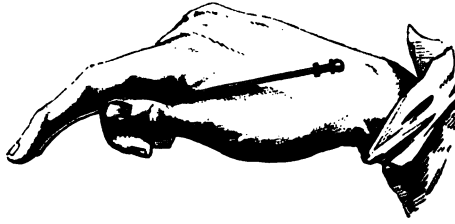
Holt's Catheter.

The urethra seems to possess some peculiar morbid sympathies, through which the introduction of the catheter is sometimes followed by unpleasant effects, as partial syncope, shock, epileptiform convulsions, and even death. These occurrences are most common in persons of a nervous, irritable temperament, or who have suffered from intermittent fever, or lived in hot climates; and cannot always be prevented, however cautiously the operation may be performed. The best way to avoid them is to insert the instrument in the recumbent posture, as they almost invariably happen when it has been passed when the patient was standing. In the event of the effects not passing off speedily, the most suitable remedies are hot alcoholic drinks, the inhalation of chloroform, and the hypodermic use of morphia.

Catheterism in the female is easy enough, unless the urethra happens to be displaced by the weight of the uterus or the pressure of some morbid growth, in which event it is occasionally attended with great difficulty. It should always be performed under cover of the clothes, while the patient lies upon her back near the edge of the bed. Ocular inspection can be justifiable only when the parts are in a state of great disease, or

when the canal has undergone much change in its relative position. The best mode of proceeding is to apply the index finger of the left hand to the upper margin of the orifice of the vagina, which thus serves as a guide to the instrument, which is placed upon its palmar surface, represented in fig. 24, and then moved

Fig. 24.



Mode of holding the Female Catheter.

upwards along the middle line, until its point arrives at the dimple-shaped depression marking the situation of the mouth of the urethra. The catheter is then passed on with its concavity upwards until it reaches the interior of the bladder; a circumstance which will be indicated by the want of resistance and the flow of the urine. Or, instead of this, the finger may be placed upon the clitoris, just below the commissure of the nymphæ, and the instrument carried from thence downwards along the central line of the vestibule, until its point slips into the tube. When there is much difficulty in performing the operation, in consequence of a change in the direction of the urethra, the ordinary instrument may be conveniently replaced by a gum-elastic one.

The female catheter is made of silver, and is not more than five inches in length. Its vesical extremity is somewhat bent, to adapt it to the shape of the urethra, and is perforated with numerous foramina, instead of having eyelets, as in the male instrument. The other end is provided with two rings, in order to fasten the instrument, when it is necessary to retain it in the bladder, by means of tapes, to a T-bandage. When the urethra has been materially changed in its direction, the most suitable instrument will be a gum catheter, or the ordinary silver male catheter.

The employment of the female catheter is liable to be attended with some curious accidents. Thus, as has long been known, if

it is not provided with rings, it may slip into the bladder, being suddenly and unexpectedly drawn from the fingers of the surgeon. A similar accident may happen to the male, as is exemplified by bits of bougie, straw, leather, pencil cases, and other foreign bodies. If the entire catheter never slips into the bladder of the male, it is only because of the greater length and curvature of the urethra and the instrument. This occurrence is due to the constant vermicular contraction of the walls of the canal, which passes towards the bladder, and to the suction force exerted by the latter organ.

In the second place, great difficulty may attend the withdrawal of the female catheter. In a case of this nature, which fell under my observation, the ordinary instrument, provided with lateral eyelets, caused neither pain nor inconvenience as long as it was kept at rest; but the moment an attempt was made to withdraw it, it was found to be so firmly grasped, that it could only be removed under chloroform, when it was forcibly extracted, with the effect of slightly lacerating the mucous membrane. The occurrence is doubtless due to spasm of the muscular structure of the neck of the bladder and urethra, and the intrusion of a fold of mucous membrane in the lateral eyelets of the instrument. To avoid this contingency, as awkward as it is painful, numerous small apertures should replace the openings of the catheter.

SECT. III.—PUNCTURE AND ASPIRATION OF THE BLADDER.

I. When the catheter and other means have failed to produce relief, the only thing that remains is to tap the distended bladder. Fortunately, this operation is seldom necessary; and thus far I have been obliged to perform it only twice, and then in cases not my own. It is only in instances of excessive hypertrophy of the prostate, attended with great swelling and tenderness of the surrounding parts, in laceration of the urethra, infiltration of urine into the scrotum, and in deep-seated impassable stricture, that the procedure should ever be thought of.

There are four routes by which the bladder may be approached when this operation becomes necessary, namely, the rectum, the hypogastric region, the pubic symphysis, and the subpubic arch. Of these, the first is the one usually preferred, on account of the

facility of performing the operation, and its supposed freedom from the danger of urinary infiltration. It is, of course, contraindicated when there is great enlargement of the prostate gland, or serious disease of the anus, rectum, or bas-fond of the bladder. Under such circumstances, the suprapubic region is selected.

a. The puncture by the rectum is executed with a curved trocar, seven or eight inches in length, and provided with a canula. The rectum being cleared out by an enema, the breech of the patient is brought over the edge of the bed, and his legs are supported by two assistants, as in the operation for stone, while a third assistant presses the bladder downwards. The surgeon, oiling the index and middle fingers of the left hand, introduces them into the bowel, in contact with its anterior wall; he now takes the instrument in the right hand, retracts the point of the trocar within its sheath, and then places it in the groove formed by the junction of the two fingers in the anus. The only thing that remains to be done is to carry the instrument on until it has fully passed the posterior margin of the prostate, when, by depressing its handle, the point is urged on through the superimposed structures into the interior of the bladder, as is shown in fig. 25. The want of resistance and a

Fig. 25.



Rectal Puncture of the Bladder

slight escape of urine will indicate that the instrument has reached its destination. By a sort of double movement, the trocar is now withdrawn and the canula pushed farther on into the distended viscus. The urine being evacuated, the canula is either at once removed, or, if there be any serious obstacle along

the natural passage, it is retained until this is surmounted. In the latter case, the instrument is secured by a T-bandage.

The operation by the rectum is simple enough; it requires little skill, and is performed in a few seconds. It is, however, not devoid of dangers and drawbacks. During its performance the bladder has been transfixed or missed altogether; the deferent ducts and seminal vesicles have been wounded, and, in one instance at least, the inflammation has extended to the testicle, which suppurated; abscesses have formed between the bladder and rectum in the track of the canula; the peritoneum may descend very low and be wounded; a permanent fistula may remain between the bladder and the bowel, permitting a reciprocal interchange of their contents; infiltration of urine is to be dreaded; and several cases have been reported in which it gave rise to emphysema, the rectal flatus diffusing itself, not only through the connective tissue of the pelvis and down the thighs and nates, but even to the upper parts of the body, and eventuating in the death of the patient. On these accounts, and particularly if the retention be due to impassable stricture, I think that the operation is far inferior to laying open the membranous urethra through the perineal raphé.

g. Puncture of the bladder above the pubes has generally been regarded as even more objectionable than by any other route, not because of any particular difficulty in the operation, but because of its greater liability, as has been conjectured, to be followed by an escape of urine into the peritoneal cavity and the surrounding connective tissue. Both events are to be dreaded, especially the former, which is almost certainly fatal in from thirty-six to forty-eight hours from its occurrence. It is, however, indicated when the hypertrophy of the prostate is so great as to render access to the bladder through the rectum impracticable, and in cases in which an artificial outlet for the urine is desirable for a long period. In executing it, the patient is placed on his back, the skin is divested of hair, and an incision is made along the median line, from an inch to an inch and a half in length, according to the leanness or obesity of the part, down to and through the linea alba. Through this opening the bladder, previously steadied by the hands of an assistant, is punctured at its lowest part, by means of a trocar, such as is used in tapping the abdomen, the point of the instrument being inclined ob-

liquely downwards and backwards in the direction of the promontory of the sacrum. Transfixion being completed, the trocar is withdrawn, and the canula gently passed into the bladder, where it is retained by an appropriate bandage, until the obstructing cause necessitating the operation has been removed. Instead of the canula, an elastic catheter, or a double silver tube, made on the principle of a tracheotomy tube, and represented in fig. 26, may be used. The patient in the mean time lies on his

Fig. 26.



Tube to be worn after Suprapubic Puncture of the Bladder.

side, to promote the escape of the urine. Mr. Abernethy, who gave a decided preference to this mode of puncturing the bladder, often performed the operation with no other apparatus than a pocket scalpel and a lancet; he did not even always, it seems, leave a canula in the organ, the collapse of this sac sometimes preventing him from finding the opening he had made into it. Notwithstanding this, he never witnessed any ill effects from the procedure, such as effusion of urine into the connective tissue or the peritoneal cavity. No hemorrhage attends the operation.

I recollect a singular instance of hypogastric paracentesis of the bladder, in which the puncture, after having been perfectly healed, reopened after a lapse of fourteen years. The patient, a farmer by occupation, was upwards of seventy-two years of age at the time of his death. In the autumn of 1831, while on a visit to the interior of Indiana, he was seized with retention of urine, for which a physician performed the operation in question, although it was doubtless unnecessary. For several months he wore a tube in the wound; upon laying aside which the part speedily cicatrized, and so continued until about four weeks before he died, when, all at once, it reopened, the integuments having been the seat, for several days, of erysipelatous inflammation. Urine afterwards continued to discharge through the abnormal passage up to the time of the patient's dissolution, the immediate cause of which was constitutional exhaustion.

7. Puncture of the bladder through the pubic symphysis was first proposed by Dr. Brander, of Jersey, in 1825; and although it has been performed successfully in several instances, the number of cases is still too limited to warrant an expression of opinion as to its relative and absolute merits. A hydrocele trocar of medium size is passed through the centre of the symphysis, somewhat obliquely downwards and backwards towards the sacrum, and should be entered, as the patient lies on his back, at a right angle with the body. A piece of flexible catheter is then inserted through the canula, and retained in the usual way. The operation, which is perfectly simple, does not involve any injury to the peritoneum, and is entirely free from the danger of infiltration of urine; no such effects, at all events, have as yet followed it in any instance. The passage of the instrument might be impeded by ossification of the interpubic cartilage; but this occurs chiefly in advanced life, and therefore constitutes no valid objection to the method.

8. Mr. Voillemier¹ has tapped the bladder by inserting a trocar by the side of the suspensory ligament of the penis, that organ having previously been drawn downwards and backwards, and tilting the instrument backwards close behind the arch of the pubes. In this procedure, which may be termed the infrapubic puncture, the instrument passes through a space between the penis and the pubes, which becomes larger as it is viewed more deeply, on account of the divergence of the cavernous bodies. In the patient operated upon in this way, the wound healed in forty-eight hours.

II. A procedure for relieving the distended bladder which will probably supersede the ordinary suprapubic operation is puncture of the viscus with capillary trocars combined with pneumatic aspiration, for the introduction of which we are mainly indebted to M. Dieulafoy² and other French surgeons. The operation is certainly perfectly harmless, it having been repeated as many as twenty-five times in twelve days; and it has never, so far as my knowledge extends, been followed by any accident.

The most convenient aspirator, and the one least liable to get

¹ London Lancet, Dec. 19, 1863, p. 717.

² *Traité de l'Aspiration des Liquides morbides*, Paris, 1873.

out of order, is that of M. Potain, represented in fig. 27. The essential parts of the apparatus consist of a rubber stopper, which may be fitted to any sort of bottle, perforated by a branched metallic tube, provided with stopcocks, to one side of which is

Fig. 27.



Aspirator

attached a gum tube communicating with an air-pump syringe, and to the other a tube to which the capillary trocar is fixed. The bottle having been exhausted of air by the syringe, and the proper attachments made, the delicate trocar is well oiled and inserted with a rotary motion through the linea alba, about half an inch above the pubic symphysis, into the bladder. It is then withdrawn sufficiently to permit the shutting off of the stopcock connected with the canula, when the corresponding stopcock of the branched tube is turned on, and the urine rushes into the receiver, which should be of sufficient capacity to obviate the necessity of repeating the procedure. To prevent the escape of any of the fluid which may remain in the canula after the operation is completed, the aspiration should be kept up during its withdrawal.

CHAPTER VI.

TUMORS AND TUBERCLE OF THE BLADDER.

SECT. I.—TUMORS OF THE BLADDER.

PRIMARY neoplasms of the bladder are uncommon, the most frequent being the fibrous, carcinomatous, and sarcomatous, while the osseous and myomatous are exceedingly rare. Of osseous growths, the only cases on record, and they are probably nothing more than examples of tumors that had undergone calcareous transformation, are a bony cyst, of the volume of a chestnut, attached to the posterior wall of the viscus of a lad, who was subjected to lithotomy by Middleton; and an ossified pedunculated growth, as large as a turkey's egg, discovered by Dupuytren in the bladder of a woman, dead of cystitis. A very remarkable and unique case of myoma in a boy, twelve years of age, has recently been reported by Professor Billroth.¹ The tumor, which was upwards of eight inches in its longest, by five in its broadest, and three inches in its basal circumference, was readily detected by abdominal and rectal palpation, and was successfully extirpated by the high operation. Serous, hydatid, and dermoid cysts, developed originally in the kidneys, the pelvic cavity, the ovaries, or the Fallopian tubes, are sometimes discharged from the urethra, or found after death floating loose in the bladder, where their presence was productive of pain and spasm, with frequent micturition, and sudden stoppage or obstruction of the flow of urine.

1. *Fibrous Tumors*.—Vesical fibroma presents itself under several varieties of form, as the tuberous, papillary, and polypoid, of which the last two are the most common and interesting from a surgical point of view.

a. Tuberous fibroma, either as a new growth of fibrous tissue, or admixed with glandular elements, when it is known as adenoid fibroma, occurs, especially in young subjects, as a bosselated,

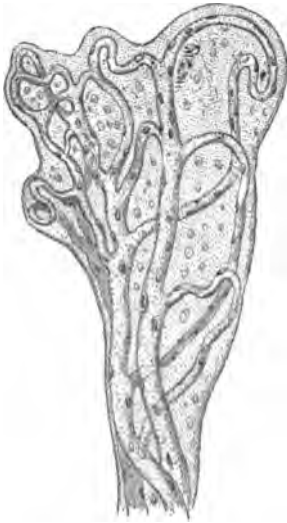
¹ Langenbeck's Archiv, Bd. xviii. p. 411, 1875.

circumscribed, somewhat elevated, or broadly pedunculated submucous tumor in the vicinity of the trigone and neck of the bladder, where it varies in size from a pea to a pigeon's egg, giving rise to symptoms of retention or difficulty in micturition, and very rarely bleeding, except from instrumental contact. It sometimes assumes a medullary appearance from proliferation of its glandular elements, the presence of which points to its derivation from the prostate, bearing, in this respect, a striking analogy to outlying or detached growths in the neighborhood of the thyroid gland.

β. Papillary fibroma, or villous growth, is by far the most frequent of the fibrous neoplasms; but its clinical history is so little understood, even at the present day, that authors usually confound it with villous carcinoma, with which it has certain points of resemblance, but from which it differs, not only in its gross and minute appearances, but in its symptoms, progress, and development, as well as in the absence of glandular involvement, metastatic deposits, and carcinomatous cachexia. With a view

to attempt to clear up the obscurities which surround it, twenty cases of undoubted benign villous tumor have been collected, from the analysis of which the following account is written.

Papillary fibroma consists essentially of a congeries of dendritic or variously branched villi, each of which is composed of a basement membrane of very delicate fibrous tissue, continuous with that of the mucous or submucous connective tissue, inclosing one or several enlarged and thin-walled capillary vessels, arranged in loops with varicose dilatations, as represented in fig. 28, from Bryant, and covered by a more or less dense layer of

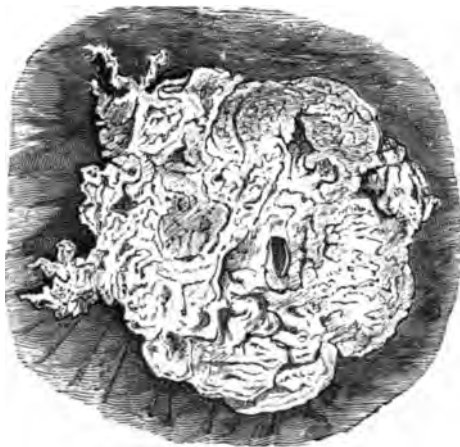


Benign Vesical Papilla.

columnar, or spheroidal and polyhedric epithelial cells. The pathological product is thus seen to have its physiological prototype in the normal villi of the

mucous membranes. In some specimens the greater portion of the bladder appears to be studded over with separate fine villi, conveying the idea of papillary hyperplasia of its mucous coat. In other cases the prolongations are thick and club-shaped, giving the surface of the growth a mammillated look. In a third class of specimens tufts of very delicate filamentous villi originate from a narrow base, with little, if any, solid element. In others, again, the villous tumor shows itself as a soft fibrous growth, slightly elevated above the surrounding surface, and clothed with papillæ which branch out from the central mass without any uniformity of arrangement. Finally, the neoplasm assumes the form of a soft polyp, covered with fringe-like processes, and attached commonly by a long, slender pedicle. These characteristics are best appreciated by floating out the growth in water, when the individual papillæ become very apparent, being often an inch in length, and bearing a striking resemblance to the chorion, or often imparting to the affected portion of the bladder an appearance as if it was overlaid with matted, white, soft fibres, or a pile of loose velvet, as in the annexed drawing, fig. 29, taken from a preparation in the pathological collection of the

Fig. 29.



Papillary Fibroma of the Bladder.

New York Hospital. In rare instances the growth is incrustated with a deposit of phosphates.

The usual seat of villous tumor is the trigone, particularly the vicinity of the orifices of the ureters, although it may spring

from the fundus, anterior wall, or neck of the bladder, in which situation it may overhang the opening of the urethra and act obstructingly. Varying in size from a pea to a goose's egg, it is generally solitary; but it may occur in such considerable numbers as to overlay the greater part of the inner surface of the viscus, as shown in fig. 30, from Civiale. In form it is

Fig. 30.



Multiple Papillary Fibroma of the Bladder.

generally globose, ovoidal, or polypoid, while its color is usually a few shades redder than that of the surrounding mucous membrane. Contrary to the common statement, the disease is most frequent in middle-aged and elderly subjects. Thus of eighteen of the twenty cases in which the precise age was noted, the youngest was twenty-two months, and the oldest seventy-two years; and all of the patients save three—aged respectively twenty-two months, thirty-three months, and eighteen years—were over thirty, the average being the forty-fourth year. Sex appears to have no influence upon its production, as ten of the cases occurred in males, and an equal number in females.

The symptoms of papillary fibroma are frequent and often uncontrollable desire to urinate, the act being difficult and painful, and liable to occasional interruption of the flow, or positive retention, due, when the growth is seated at the neck of the bladder, to its intrusion into the vesical orifice of the

urethra, or, in rarer instances, to impaction of clots in the canal. By far the most reliable sign is hematuria, which is invariably present at some stage of the affection. In exceptional instances a little blood mixed with the urine is the earliest symptom; and in ten per cent. of the cases a sudden hemorrhage, coming on without assignable cause, the loss being constant or subject to occasional remissions, is the only feature from first to last. In the majority of examples, however, it is preceded by signs of vesical irritability, and does not show itself until the affection has existed for several months. The blood is usually mixed with the urine, its quantity increasing *pari passu* with the other symptoms; but it may be passed in its pure state before, or, as more often happens, at the completion of micturition, when the act is attended with great straining.

The hemorrhage in these cases is often profuse, and from its constant recurrence, it is the most fruitful source of death. That the villi should bleed is scarcely to be wondered at, as their enormously dilated vessels are being constantly laid bare by the exfoliation of their soft and delicate epithelial covering, a process which is favored by the irritation of the decomposing urine, thereby exposing them to insult from the spasmodically contracting hypertrophied bladder. Exploration with a sound always excites bleeding and pain, and is liable to be followed by retention.

Suffering, apart from that experienced in connection with micturition, is not a prominent feature of the disease. Essential pain, pain connected with the presence of the tumor itself, was only complained of to a severe degree by three patients, and it was referred to the hypogastrium and the back.

On the whole, it may be said that, in the absence of prostatic or calculous disease, glandular involvement, and carcinomatous cachexia, the existence of papillary fibroma is rendered highly probable by symptoms of vesical irritability, with occasional attacks of retention of urine, and hematuria, more or less profuse, as a constant or frequently recurring sign, without any obvious cause. Conclusive evidence of its true nature is afforded by the appearance of a villous growth at the orifice of the urethra, as happened in the case of a young girl, or by the discharge of detached vascular tufts, which afford the minute appearances previously described. Unless the growth is pedun-

culated, or contains a considerable amount of solid material, sounding will throw no light upon it.

The prognosis of this affection, if left to pursue its course without surgical interference, is of the worst possible description, since death almost invariably follows from sheer loss of blood, or the combined effects of hemorrhage and pain. A further analysis of the twenty cases shows that fourteen, treated merely by palliative measures, were fatal: one from cholera; one from uremia, due to obstruction of the ureters by clots derived from similar growths in the kidneys; three from the exhaustion produced by suffering and loss of blood; and nine from hemorrhage alone. Of the remaining six cases, to which reference will again be made, one passed the growth during an act of straining, and five were subjected to operations, of which two recovered, one was benefited, and two died.

The morbid conditions of the other parts of the urinary tract refer principally to hypertrophy of the muscular walls of the bladder. In a few instances there was no concomitant disease whatever. In ten the viscus was more or less hypertrophied, associated in two with great contraction; in one with abscess near the tumor; in two with pyelitis; in two with thickening and dilatation of the ureters and pelves of the kidneys; and in one with sacculation of the bladder and villous growth of the kidneys.

γ. Polypoid fibroma, or polyp, is exceedingly uncommon. Ordinarily pyriform or globular in shape, and usually attached by a narrow pedicle, it is either smooth and even, or more or less lobulated, at its periphery, and made up, in the great majority of instances, of lax, succulent, delicate filamentous tissue, or, more rarely, of firm interlacing fibres. It is poorly provided with bloodvessels, and is covered by a reflection of the vesical mucous membrane, the cells of which are generally normal, although they may be present in the form of flat tessellated epithelium, in immense quantity.

Excluding the cases recorded by Lusitanus, Kirchner, Sylvius, Rollin, and other older authors, and those in which villous hyperplasia is a prominent feature of the growth, fifteen examples of fibrous polyp have been collected, of which eight occurred in males, and seven in females, their ages varying from thirteen months to fifty-six years. In only six were the subjects impubic,

the average age being the twentieth year. The duration of the affection, from its first manifestation until its close, ranged between five weeks and three years, the average being fourteen weeks.

These tumors occasionally coexist with urinary calculus, or they may be incrustated with crystals of triple phosphates. In size, they vary from a pea to a closed fist, and they are usually single, or, if multiple, they arise either at several distinct points, or are clustered on a common pedicle. They evince a remarkable predilection for the neck of the bladder, near the orifice of the urethra, not less than nine of the instances having had their origin at that locality, the remainder having developed from the fundus of the organ. In a case narrated by Dr. Willis,¹ a pendulous growth, of the volume of a cherry, and covered with calculous matter, hung from the anterior wall of the bladder, so as to act as a valve at the urethral opening.

The symptoms of vesical polyp are chiefly of a mechanical character, the most prominent being difficulty in urination, sudden stoppage of the flow, and frequent attacks of painful retention, owing to the mass obstructing the orifice of the urethra, or intruding itself into it, requiring, in exceptional instances, the daily use of the catheter. Hemorrhage is very infrequent, it having occurred in only four of the fifteen cases, in three of which it was slight and recurred at long intervals, while in one it was occasioned by the introduction of instruments. In two boys, of the respective ages of thirteen and eighteen months, in addition to the other rational signs, reflected pain at the head of the penis, which is so characteristic of stone in children, was most marked. In all of the females, a constant and extremely valuable symptom was protrusion of the tumor from the urethra at the vulva, and in several of the males it projected into the prostatic portion of the canal. A case, recorded by Mr. Stanley,² deserves especial notice in this connection. In consequence of obstruction of the urethra by the morbid growth, attended with frequent attacks of retention, the urine was forced into the imperfectly closed orifice of the urachus, which gradually reopened under the constant pressure, until the urine reached the vicinity

¹ *Urinary Diseases and their Treatment*, London, 1838, p. 284.

² *Trans. Path. Soc. London*, vol. iii. p. 127; and *Med. Times and Gazette*, 1852, vol. ii. p. 106.

of the umbilicus, where an abscess formed, and gave exit to pus and urine, upon its evacuation, nine days before death. The patient was a male child, thirteen months old, who had presented symptoms of stone for ten weeks. On dissection, a soft, lobulated growth was found to be attached, at each extremity, by a pedicle to the bas-fond of the bladder, just behind the ureters, which were dilated, while its central portion could be propelled forwards over the meatus during micturition.

The diagnosis of polypoid fibroma is based upon the foregoing symptoms. From other tumors it is distinguished by the absence of essential pain, and by difficulty of micturition, as the earliest symptom, followed, in exceptional instances, by hemorrhage. It is met with at an earlier age than papillary fibroma, and, unlike it, the bleeding is not only not a constant sign, but, when it does occur, it is of trifling importance. In rare instances, as in the cases of two children, the growth can be felt, enveloped by the contracted bladder, through the abdominal walls. This does not occur in villous tumor. From calculus it may be differentiated by the introduction of the sound, which may be felt to touch the growth, but does not elicit a metallic note. Instrumental exploration is very liable to be attended with deviation of the beak of the catheter to one side or the other, and it may even be impossible to carry it onwards, so that lateral movements are impossible. A similar phenomenon is witnessed in hypertrophy of the prostate, but the latter condition may be determined by a digital examination through the rectum, and by the advanced age of the patient. In females a protruding polyp might be mistaken for eversion of the bladder, or vascular tumor of the urethra; but by careful exploration, and tracing the mass with the finger or probe, its true nature is readily determined.

The prognosis of this affection is most unfavorable, when it is not opportunely interfered with, a fatal issue invariably occurring from retention of urine and its effects upon the associated organs, especially the kidneys. In the cases not cured by operation, the principal lesions found on dissection were, dilatation of the urethra and neck of the bladder, with hypertrophy of the muscular coat of the latter viscus, and enlargement of the ureters and pelves of the kidneys, the tissues of which organs were in various stages of inflammation.

2. *Carcinomatous Tumors.*—Among the rarest of surgical affec-

tions must be ranked primary carcinoma of the bladder, although it is not very uncommon as a metastatic deposit, or as the result of the extension of a similar growth from the uterus and vagina in the female, and the rectum and prostate in the male. Indeed, it may be asserted that the majority of so-called primary cancers arise from proliferation of the epithelial elements of the acini and ducts of the prostate; its connection with the posterior portion of that organ being proved not only by dissection, but by its incomparably more frequent occurrence in men than in women.

The usual variety of carcinoma, met with in the bladder, as shown by modern histological research, is the epithelial. What was formerly known as scirrhus is nothing more than the firm, infiltrating form of epithelioma, characterized by a dense stroma of fibrous tissue, pervaded by small and infrequent alveoli, which contain heaps of loose epithelial cells and epidermic pearls. The soft, juicy, medullary, or fungoid form of the affection, generally denominated encephaloid, is of the same nature, but its stroma is more delicate and more vascular, and the loculi larger, while the cells are the seat of granular and fatty metamorphosis and disintegration. In many specimens, the latter assume a cylindrical shape, when the mass presents the minute appearances afforded by cylindrical epithelioma of the gastro-intestinal mucous tract. Other varieties of carcinoma are almost unknown.

When the affection has existed for some time, the overlying mucous membrane occasionally becomes the seat of papillary hyperplasia, the delicate prolongations reposing either upon an unbroken, soft, spongy, elevated, or polypoid tumor, or upon an ulcerated surface. The connective tissue of the villi becoming infiltrated, by continuous growth from below, with epithelial cells, polymorphous, or in the form of concentric pearls, or cell cylinders, as shown in fig. 31, reduced from Demme, gives rise to the so-called "villous cancer," which, from its macroscopic resemblance to papillary fibroma, has been, and is yet, generally confounded

Fig. 31.



Carcinomatous Vesical Papilla.

with it. It is, however, far less common than the benign villous growth, from which it is to be distinguished by the infiltrated villi reposing upon a base which shows the minute features of carcinoma, and by the proliferation of villi into the main mass.

Epithelioma is observed more frequently in males than in females, in the proportion of about six to one, and is almost peculiar to advanced life, being most common between the forty-fifth and eightieth years, occurring very rarely before the fifth decade, the average age being fifty-eight, agreeing in this respect with the disease as it is met with in other organs of the body. The parts most liable to be affected are the neck, trigone, and bas-fond, along with the openings of the ureters; and it is seldom seen at the summit or anterior wall. It may occur as a circumscribed solitary tumor, projecting into, and almost filling up, the bladder; or in the form of small nodules, from the volume of a pea to that of a walnut; or it may infiltrate all the tunics of the viscus, so as to convert them into a dense mass, varying in thickness from a quarter of an inch to two inches; or form a broad, thick belt around the entire circumference of the bladder, from its neck as far as the ureters, as in the case of a gentleman, narrated in a former edition of this work. The tumor, when it is of long standing, whether it be of an encephaloid or scirrhus appearance, is usually in a state of advanced ulceration, and presents a foul, ragged surface, several inches in diameter; or the ulcer and its edges are beset with long and swollen villous excrescences; or it may be simply occupied by soft, friable, broken-down, pulsatous material and clotted blood.

During the progress of the disease, the associated organs, as the prostate, ureters, and kidneys, are liable to be implicated, and the bladder may adhere to the surrounding parts, and communicate with the vagina, uterus, rectum, colon, or ileum. The viscus itself, on dissection, is usually found to contain a small quantity of dark-colored, fetid urine, mixed with pus, lymph, or blood. Sometimes the organ is very much contracted, while at others it is greatly enlarged. In many cases, its intermediate substance is healthy; in others it is diseased and hypertrophied. The ureters and kidneys are also now and then affected, most commonly dilated, from the morbid growth plugging up the orifices of the former, thereby causing the urine to accumulate in their interior, and occasion death from uremia. Secondary

deposits are found in about one-half of the cases in the kidneys, liver, iliac and lumbar glands, and lungs, in the order here mentioned.

Carcinoma of the bladder usually runs its course with great rapidity, death ensuing from the effects of retention of urine, perforation of the viscus, infiltration of urine, or peritonitis, on an average in less than twelve months. Occasionally, however, life is prolonged for eight or nine years, of which remarkable instances are recorded by Lambl, Sir Henry Thompson, and Mr. W. Michell Clarke. These were examples of villous medullary epithelioma, and hemorrhage was a prominent symptom from the first.

The most reliable signs of epithelioma, in addition to those of vesical irritability, are pain, hemorrhage, and constitutional cachexia. Suffering and hematuria are present in at least three-fourths of all cases, the former being often of the most excruciating character, and referred to the hypogastrium, perineum, loins, and testes. In a noteworthy instance of scirrhus epithelioma, under the care of Dr. John Ashhurst, the specimen of which was exhibited at the Pathological Society of Philadelphia, in the fourth volume of the Transactions of which body the case is reported, there was neither pain nor hemorrhage at any stage of the affection, the immunity from suffering being ascribed to the absence of ulceration. It is to be remembered, however, that although it is commonly a late symptom, pain is not always dependent upon an open state of the growth, since in one-third of the cases, in which suffering was complained of, the tumor was found, on dissection, to be entire. Hemorrhage, profuse and long-continued, on the other hand, is ascribable to a broken-down or ulcerated state of the morbid mass, or to secondary villous formations on its surface; but, unlike what occurs in the ordinary villous growth, although it may be a most prominent symptom, it never exists alone. The carcinomatous cachexia, as denoted by the progressive emaciation and loss of strength, and the wan and sallow state of the countenance, is rarely wanting in the later stages of the disease.

Additional evidence of the existence of carcinoma may be elicited by rectal and hypogastric palpation, and the sound, and, in thin subjects, the enlarged lymphatic glands may be felt through the abdominal walls. The small fragments of the growth, which

are occasionally discharged along with the urine, present, after proper hardening and section, the distinctive features of carcinoma; or if minute tufts, which represent enlarged, and vascular, and infiltrated villi, can be detected, the diagnosis is established beyond the possibility of a doubt. Not the slightest reliance can be placed, as was so often done before the prehistological period of morbid growths, in the cells voided with the urine, as the transitional forms of epithelium lining the genito-urinary tract, particularly those of the second and third rows of the bladder, are so similar to those of carcinoma, that the distinction is impossible.

Almost the only affection with which epithelioma is liable to be confounded is papillary fibroma, or villous growth. For the purpose of pointing out their differential diagnosis, their characteristics are given in the subjoined table:—

<i>Epithelioma.</i>	<i>Papillary fibroma.</i>
1. Is a disease of elderly persons, the average age being the fifty-eighth year. Never occurs in children.	1. An affection of adult life, the average age being the forty-fourth year. Ten per cent. of cases met with in impubert subjects.
2. Most common in males.	2. Sex exerts no influence upon its production.
3. Pain present in seventy-five per cent. of cases.	3. Pain in only fifteen per cent. of cases.
4. Hemorrhage in seventy-five per cent. of cases. Usually a late symptom, and never the only one.	4. Hemorrhage of constant occurrence, and often at outset without obvious cause. In rare cases the only symptom throughout.
5. May be detected by the sound, and manual exploration of the rectum and hypogastrium.	5. Eludes digital and instrumental examination.
6. Never protrudes at the vulva.	6. May appear at this point.
7. Discharged fragments show carcinomatous structures.	7. Discharged fragments show no epithelial proliferation.
8. Carcinomatous cachexia late in the disease.	8. No such appearance in villous growth.
9. Lymphatic involvement may be detected by palpation of abdomen.	9. The glands of pelvis and loins never contaminated.
10. The affection terminates fatally, on an average, in twelve months.	10. Fatal result seldom earlier, on an average, than three years.

3. *Sarcomatous Tumors.*—Sarcoma of the bladder, as verified by the microscope, is so rarely met with that it is impossible to give a satisfactory account of its clinical features. It is quite certain, however, that many neoplasms, reported as encephaloid

cancer, occurring before the fortieth year, and composed of small round cells, closely packed in a homogeneous, or finely granular, or imperfectly fibrillated, intercellular substance, should be classified under this head; and it is highly probable that tumors have been included under polypoid and villous growths which were composed of sarcomatous tissue. It may be stated, in a general way, that sarcoma occurs earlier in life than papillary fibroma and epithelioma; that it shows little tendency to bleed, even when subjected to surgical interference; and that it is attended with symptoms of obstruction of the flow of urine, without being the seat of essential pain.

Dr. Gersuny¹ has given the details of the case of a man, forty-nine years of age, in which a firm, elastic, lobulated spindle-celled tumor, of the volume of a hen's egg, was attached by a long, delicate pedicle to a diverticulum at the base of the bladder, where it had, for five years, excited symptoms of vesical irritability and retention of urine, requiring the constant use of the catheter. The growth could be felt by the sound and the finger in the rectum. A fatal attempt was made to remove it by median cystotomy; but it might have been reached through the bowel.

An example of pedunculated round-celled sarcoma of the bladder, associated with similar disease of the vagina and vesico-vaginal septum, is recorded by Mr. Marcus Beck in the twenty-fifth volume of the Transactions of the Pathological Society of London. A child, two years of age, suffered from incontinence and attacks of pain and straining on micturition, followed by slight bleeding. Twelve months previously, six small polyps had been removed by the ligature from the vagina. A mass of growths, some of which were as large as grapes, projected from the urethra, distending it so widely that it was at first mistaken for the vagina. Death occurred, without further interference, from exhaustion, sixteen months from the commencement of the disease. The bladder, on dissection, was found to be hypertrophied, and the tumors sprung from the thickened mucous membrane of its neck and base.

A most instructive instance of spindle-celled growth has been reported by Dr. Sennleben,² from the practice of Professor

¹ Langenbeck's Archiv., Bd. xiii. 1872, p. 131.

² Ibid., Bd. i. 1861, p. 128.

Langenbeck. A woman, twenty-nine years of age, had been troubled with dysuria and incontinence for fourteen months, and during forcible efforts to empty the bladder and rectum a red, fleshy mass protruded from the widely dilated urethra which she was in the habit of snipping off, the operation being attended with neither pain nor hemorrhage. Attempts to tear away the tumor with forceps were useless, on account of its great friability. Death ensuing from peritonitis on the fourth day, a firm, elastic, villous growth, of the size of a walnut, was found to originate from the intermuscular connective tissue of the neck of the bladder, the base of that viscus having been perforated by the forceps.

The treatment of tumors of the bladder is palliative and radical. The former, which has, as a rule, alone been resorted to, consists in allaying pain and spasm, by anodynes, in full and repeated doses, and in preventing and arresting hemorrhage, which is so troublesome a complication. To fulfil the latter indication, everything tending to favor a determination of blood to the pelvic organs, as riding, prolonged exercise on foot, warm hip baths, and venereal indulgence, should be scrupulously avoided. The bowels should be maintained in a soluble condition, and the diet should be nourishing, and consist of such articles as are not productive of flatulence and dyspepsia. When bleeding has once set in, our main reliance is upon opium and acetate of lead, gallic acid, and alum, with acidulated drinks, and rest in the recumbent posture, with elevation of the pelvis. In a case of villous tumor, under the care of the author, prompt relief was always afforded by a dose of calomel and rhubarb, followed by alum and opium, with sulphuric acid and infusion of roses as a common drink. A highly efficacious combination is ten drops each of turpentine and dilute sulphuric acid, with five grains of gallic acid, administered every few hours.* When the ordinary remedies fail, a drop of creasote, given in the form of emulsion, every two hours, also proves servicable, as do also the tincture of ergot, and the solution of pernitrate of iron. The action of these medicines is promoted by the application of ice bags to the hypogastrium and perineum, and a conical plug of ice introduced into the rectum, vagina, or even the bladder, sometimes acts like a charm. Direct medication, in the form

of astringent injections, such as solutions of acetate of lead, alum, gallic acid, persulphate of iron, ergotine, and nitrate of silver, should be cautiously resorted to in obstinate cases. It is of the last importance to remember that, when the hemorrhage is at all troublesome, it is usually due to the hypertrophied bladder contracting down upon a villous or ulcerated growth, to prevent which, the patient should be taught to relieve the organ with a soft catheter, in order that he may retain at least an ounce of urine.

For the relief of papillary and polypoid fibromas surgical interference is imperatively demanded, since, without it, a fatal issue is almost the inevitable result. Among the earlier operations in this direction are those of Civiale,¹ in which the tumor was seized and torn away with the trilabe, or crushed by a lithotrite, and left to drop off and be spontaneously discharged, or be extracted several days subsequently. Although the French surgeon reports many successes, his practice does not appear to have gained any followers. In male subjects the only rational mode of attacking these growths is by opening the bladder, and removing them, in accordance with the extent of their attachments, by enucleation, avulsion, scraping, *écrasement*, or ligation. In females, on the other hand, cystotomy is generally uncalled for, since on account of the greater shortness and dilatability of the urethra, and the absence of the prostate, access to the tumor is rendered easy, and attended with less risk.

That the bladder may be opened, when it contains a new growth, with a pretty fair prospect of success, is attested not only by formal operations practised for their removal, but by several recorded instances, in which, under the belief that the patients were affected with calculous disease, cystotomy was resorted to. Mr. Crosse, of Norwich, under these circumstances, disclosed a mass of polypoid excrescences, as soon as the membranous urethra was opened, which were removed with the scissors, but the child, which was much prostrated by previous suffering, died in forty-four hours, after uncontrollable vesical tenesmus. Petit,² of Lyons, cut a man, twenty-eight years of age, and discovering the presence of a tumor, decided that nothing

¹ *Traité Pratique sur les Maladies des Organes Génito-Urinaires*, 1800, t. iii pp 151-175.

² *Méd. du Cœur et Discours*, etc., p. 349.

more was to be done. On death from phthisis, one year afterwards, a pyriform polyp, with a very delicate pedicle, and as large as the fist, was found to occupy the bladder. There are, moreover, at least three examples of operations for stone, which were complicated by the existence of morbid growths, and they were all successful. In one, Desault removed the calculus, and twisted off the tumor; while in two, which occurred to Deschamps, and the author, the stones were extracted, but the neoplasms were not interfered with. The latter case was that of a lad, fifteen years of age, who was greatly emaciated, and was almost worn out by constant suffering. A large phosphatic concretion was removed by the lateral incision, at the Clinic of the Jefferson Medical College, in the winter of 1874, and the anterior wall of the bladder was felt, by vesical and hypogastric palpation, to be the seat of a sessile, lobulated, firm, elastic tumor, which was probably of a myomatous nature.

In the male, the best mode of reaching these growths, particularly if they be at all voluminous, is by epicystotomy. To gain as much room as possible, Billroth, after having first verified the diagnosis by opening the bladder through the perineum, cut the recti muscles at their insertions, and incised the bladder transversely. A portion of the tumor was torn away, and the remainder tied and dissected off from the muscular coat, in which it originated. Two arteries were ligated and the threads brought out at the upper wound. To guard against infiltration of urine, the wound in the bladder was not approximated, but a drainage tube was passed through the organ, and allowed to hang out of the lower opening. The reaction was moderate, and the boy was discharged on the thirty-second day, a truss having been adjusted to prevent hernial protrusion.

In females, under similar circumstances, the bladder may be reached above the pubes; but if a cutting operation be decided upon, it will be best to confine it to a median incision, commencing at the posterior orifice of the urethra and terminating at a level with the ureters, through the vesico-vaginal septum. An opening of this size will readily admit the introduction of two fingers and the interior of the organ can be dragged into view by inserting double hooks into the mucous membrane at each side of the incision. On the completion of the operation,

the edges of the wound should be brought together by the shotted wire suture, to guard against the formation of a fistule.

When the tumor protrudes at the female urethra, as usually happens, a ligature should be passed through its substance, and a stout wire passed over it, by means of a double canula, when, by making traction on the thread, the loop can be slipped down to its attachment, and strangulation be effected. At the expiration of forty-eight hours, the mass may be removed by giving the canula a few twists, which is far preferable to allowing it to slough off spontaneously. In other cases, as in the majority of villous growths, which only exceptionally occur as pedunculated growths, it will be necessary to dilate the urethra, and the more rapidly this is done, the less risk will there be of subsequent incontinence of urine. For this purpose the thoroughly anesthetized patient is placed in the lithotomy position, and the hard rubber cylindrical specula of Professor Simon, of Heidelberg, are successively introduced, with a rotary motion and without force. The set consists of seven numbers, of which No. 1 corresponds with No. 27 of Charrière's catheter scale, and has a diameter of nine millimetres; No. 2 of eleven mm.; and so on up to No. 7, the diameter of which is two centimetres, or four-fifths of an inch. The annexed drawing, fig. 32, represents No. 5 of its natural size. The introduction of the largest instrument is scarcely possible without the previous nicking of the urethral orifice with the bistoury, in several directions. On removing the obturator the growth is fairly exposed, and can be strangulated, cut, scraped, or torn away, as may be deemed proper. In this way Professor Simon has succeeded in scraping off papillary fibromas, by means of a sharp spoon-shaped instrument, the bowl of which is bent at a right angle with the shaft; and he declares that in upwards of fifty cases, in which he has resorted to this mode of dilatation, either for diagnostic or therapeutical purposes, not only was there no subsequent incontinence, but

Fig. 32.



Simon's Urethral Speculum.

the bladder was capable of retaining water thrown into it immediately after the withdrawal of the speculum.

Previous to subjecting the patient to a cutting operation, it would be well to imitate the practice of Dr. Mass, of Breslau,¹ which consists in pouring water into a double-current catheter inserted in the bladder, and relying on its rapid outward flow to entangle the growth in the eye of the instrument. In this way, Dr. Mass succeeded, in three adult males, in removing small, pedunculated mucous polyps.

The following table exhibits the statistics of sixteen operations for the removal of vesical growths. It will be seen that six were fatal; two in males after cystotomy; and four in females, one from avulsion, and three from ligation, the latter being children, in whom surgical measures hold out little prospect of relief, on account of the multiplicity of the tumors, thereby rendering them inaccessible, unless by suprapubic incision. Of nine adult females, all recovered save one, death in this instance being due to peritonitis from perforation of the bladder by the forceps in attempts to tear away a sarcomatous polyp.

¹ Berl. Klin. Wochschft., Jan. 24, 1876.

Table of 16 Operations for the Removal of Tumors of the Bladder.

No.	Sex.	Age.	Nature of tumor.	Mode of procedure.	Result.	Operator.	Remarks.	References.
1	M.	2 yrs.	Multiple polyps	Perineal cystotomy and dissection	Death	Crosse	Not entirely removed	A Treatise on the Formation, etc., of Urinary Calculi, 1835, p. 44.
2	M.	49 "	Sacculated sarcomatous polyp	Perineal cystotomy	"	Gersuny	Failed to reach growth	Langenbeck's Archiv, 1872, Bd. xiii. p. 131.
3	M.		"Pedunculated fungus"	Perineal cystotomy and avulsion	Recovery	Desault	Coexisted with stone	Chopard, Traité des Voies Urinaires, t. ii. p. 98.
4	M.	12 yrs.	Myoma	Epiplasty, avulsion, and excision	"	Billroth	Patient well on 32d day	Langenbeck's Archiv, 1875, Bd. xviii. p. 411.
5	F.	5 "	Multiple polyps	Ligation	Death.	Birkett	Not entirely removed	Med. Chir. Trans., vol. xli. p. 314
6	F.	22 mos.	Papillary fibroma	"	"	Guersant	A second growth discharged spontaneously	Gazette des Hôpitaux, No. 23, 1868.
7	F.	33 "	" "	"	"	Pfiesinger	Not entirely removed	Wurta, Med. Corr. Blatt, No. 23, 1834.
8	F.	23 yrs.	Fibrous polyp	"	Recovery	Warner	Dropped off on 6th day	Cases in Surgery, 4th ed., p. 303.
9	F.	56 "	" "	"	"	Bishop	Nearly 3 inches in length	Gross' Surgery, 5th ed., vol. ii. p. 736.
10	F.	45 "	" "	"	"	Thiennemann		Amer. Journ. Med. Sci., July, 1845, p. 224.
11	F.	70 "	Papillary fibroma	Scraped off	"	Simon	Well 5 years subsequently	Langenbeck's Archiv, Bd. xviii. p. 177.
12	F.	40 "	" "	"	"	"	Filled nearly two-thirds of bladder	Langenbeck's Archiv, Bd. xviii. p. 177.
13	F.	44 "	" "	"	"	"	Another operation required	Langenbeck's Archiv, Bd. xviii. p. 177.
14	F.	40 "	Fibrous polyp	Avulsion	"	Jackson	Weighted 8½ ounces	Boston Med. and Surg. Journ., Aug. 25, 1870, p. 120.
15	F.	60 "	Villous tumor	Avulsion and ceruse-ment	"	Illicks	Hemorrhage arrested with lint and per-chloride of iron	London Lancet, vol. i., 1868, p. 686.
16	F.	29 "	Sarcomatous polyp	Avulsion	Death	Langenbeck	Bladder perforated by forceps	Archiv, Bd. i., 1861, p. 128.

SECT. II.—TUBERCLE OF THE BLADDER.

The bladder, particularly its neck, bas-fond, and vicinity of the ureters, is sometimes the seat of tubercular disease, occurring in the form of minute gray or cheesy, spherical or rounded nodules, of a semiconcrete consistence, scattered in the superficial layer of the mucous membrane, and surrounded, while in a crude state, by delicate vascular areas. After these bodies have existed for an indefinite period, they coalesce, soften, and are finally entirely broken down, leaving in their stead so many roundish, circumscribed ulcers, the bases and ragged and undermined edges of which have a yellowish appearance, due to their infiltration with gray and cheesy miliary tubercles, as is shown by minute examination. By the confluence of several small ulcers, larger secondary ones are produced; and not infrequently to such an extent as to destroy the greater portion of the mucous membrane.

Tubercle of the bladder is invariably associated with a similar deposit in other parts of the body, and is usually the result of extension of the disease from the prostate or seminal ducts, or, as more rarely happens, from the kidneys or ureters, on which account it is rarely met with in females. In the case of a woman, twenty-four years of age, under the care of the author, in 1854, along with almost universal destruction of the mucous coat, there was extensive infiltration of the right ureter; the corresponding kidney was the seat of a tubercular abscess; the Fallopian tubes were filled with strumous pus; the left ovary contained a solitary crude deposit; the rectum and lower portion of the colon were covered with ulcers; the lungs contained numerous tubercles; and a few of the bronchial glands were invaded by the disease. Its coexistence, however, with tuberculosis of the lungs is uncommon.

In six cases, the details of which are given in the last edition of this work, the bladder was more or less extensively ulcerated, the mucous membrane in several of them being completely destroyed, and the muscular fibres, thickened, and even fasciculated, as neatly dissected as if it had been done by the anatomist. The kidneys, one or both, were tuberculated in every instance; the ureters suffered in four, and the urethra in two. In two of the cases there was tubercle of the prostate, and in one of the

seminal vesicles. The lungs were affected in two cases; and the lymphatic glands of the pelvis were involved in one instance, and the bronchial glands in another. One of the patients had psoas abscess, one iliac abscess, and one recto-vesical abscess.

There are no symptoms which point definitely to the existence of this affection. Before softening takes place, there is merely a slight degree of vesical irritability; but when ulceration has set in, the prominent signs are a frequent and gradually increasing desire to urinate, with more or less pain in performing the act. The urine is purulent and generally bloody, or pure blood may be passed at the completion of micturition. The emaciation is progressive, and death is always preceded by hectic fever, and occasionally by exhausting diarrhœa. Tubercle of the bladder is a disease of young adults, the average age being twenty-six years; and destroys life in from one to two years.

The treatment consists in the administration of tonics, cod-liver oil, iodine, and anodynes, along with a nutritious diet and recumbency. Should the suffering be acute, and the bladder be intolerant of the presence of a small quantity of fluid, it may be opened through the perineum, so as to afford an escape for the urine as fast as it is secreted. In the female, the affected portion of the mucous membrane may be brought into view by Simon's specula, and be pencilled over with a strong solution of nitrate of silver.

CHAPTER VII.

VARIX AND HEMORRHAGE OF THE BLADDER.

SECT. I.—VARIX OF THE BLADDER.

VARICOSE enlargement of the vesico-prostatic plexus of veins was described by some of the older writers under the term hemorrhoids, in reference to the resemblance, real or fancied, which it occasionally bears to hemorrhoids of the anus and rectum. It is rare, however, that the disease is so well defined as to entitle it to such an appellation. In the seventeenth and eighteenth centuries, the affection received the special attention of Bonetus and Morgagni, who have each left some well-marked examples of it.

Although the disease occurs most commonly in old age, it is sometimes observed at a comparatively early period, especially in persons who have been long afflicted with stone in the bladder, stricture of the urethra, hypertrophy of the prostate gland, or organic disease of the anus and rectum. The enlargement may be circumscribed or diffused, according to the number of vessels implicated in the disease, and it may present itself in various degrees, from the slightest increase in the size of the affected vessels to the most remarkable dilatation. In the more confirmed forms, the veins are not only much augmented in volume, but they have a tortuous, convoluted arrangement, similar to what occurs in varix of the leg and thigh. When thus affected, their walls are always more or less thickened from interstitial deposits, and their cavities are occupied by fibrinous concretions. The connective tissue through which the enlarged vessels ramify is also materially increased, forming not infrequently a thick, dense mass, divisible, especially along the *bas-fond* of the bladder, into a number of layers. While these changes are going on upon the exterior of the organ, a similar but less conspicuous enlargement occasionally takes place within at the neck and most dependent portion of the body of the viscus.

The disease here consists either in a simple varicosity, or in the development of vascular growths, not unlike hemorrhoidal tumors, both in their structure, color, and consistence. Such tumors, however, are uncommon; they seldom exceed the volume of a small filbert, and are usually situated near the neck of the bladder. In general, they are associated with other diseases, particularly stone, which, no doubt, often acts as an exciting cause.

The influence of mechanical obstruction in causing varix of the bladder is rendered very apparent by the fact that the disease is almost invariably associated with stone in the bladder, obstruction to the evacuation of the urine, and organic affections of the anus and rectum. The current of the blood being thus habitually interrupted, the distended vessels become gradually dilated and tortuous, as well as seriously changed in their structure from the effects of chronic inflammation, the inseparable concomitant of such a condition.

There are, unfortunately, no symptoms by which this disease can be distinguished from other affections. Its existence must always be a matter of inference rather than of positive demonstration. A person may be supposed to be laboring under it when, if he has stone in the bladder, stricture of the urethra, or hypertrophy of the prostate gland, he has frequent attacks of hemorrhage, venous in its character, not profuse, and attended with a sense of weight low down in the pelvic region. The enlarged vessels, under such circumstances, sometimes give way, especially during straining and the introduction of instruments, although the bleeding is seldom either profuse or protracted. Bonetus¹ describes a case where a disease of this kind simulated stone in the bladder. The patient at length died, when no calculus was discovered, but the veins around the neck of the organ were varicose and very much distended with blood. In the section on hemorrhage of the bladder will be found the particulars of a case, observed by Professor Laugier, of Paris, in which the bleeding was so abundant as to prove fatal.

When the existence of varices is suspected, relief should be attempted, first, by the removal of the exciting cause of the disease, and secondly, by the application of leeches to the peri-

¹ Sepulchrum, lib. iii. sec. xxv. p. 263.

neo-anal region, the cold douche, the frequent introduction of cold water or lumps of ice into the rectum, and the use of mild laxatives, with rest in the recumbent posture. All heating and drastic cathartics must be avoided, an account of their tendency to stimulate the lower bowel, and thus invite a determination of blood to the affected parts. For the same reason diuretics should be interdicted, especially the different preparations of cantharides. The manner in which the hemorrhage, consequent upon a division of these vessels, is to be arrested, will be pointed out under the head of lithotomy.

The hemorrhage which occasionally attends this affection should be controlled, if possible, by the exhibition of gallic acid, acetate of lead, creasote, and other appropriate remedies; aided by injections of cold water into the rectum, and the application of ice to the perineum and hypogastrium.

SECT. II.—HEMORRHAGE OF THE BLADDER.

The presence of blood in the urine, technically denominated hematuria, is not of very frequent occurrence in vesical affections. The blood may be derived from any portion of the genito-urinary mucous tract; or it may be symptomatic of other affections. Hence, it is not always easy to draw a distinction between hemorrhage dependent upon causes resident in the bladder, and causes which act on some other portion of the urinary apparatus.

Vesical hemorrhage occurs in both sexes and all periods of life. Men, however, are more prone to it than women, and it is likewise more common in middle-aged and advanced subjects, of a weak, lax habit of body, than in children and young adults. It occurs in association with, or as a consequence of, purpura, scurvy, rubeola, smallpox, plague, and typhoid fever, or as a symptom of compression of the ascending colon, from cirrhosis of the liver, or other obstructing causes. The bleeding may be vicarious of the menstrual flow and suppressed hemorrhoidal discharges; and a considerable loss of blood occasionally results from the use of drastic cathartics and irritating diuretics, especially cantharides and oil of turpentine, which occasion acute congestion of the vesical mucous membrane.

The traumatic form of hemorrhage is usually the result of

injuries from a blow, fall, or kick, or of a wound, such, for instance, as is made in the operation of lithotomy; or of the rude or forcible use of instruments, as the lithotrite, sound, or catheter. Persons affected with stone are very liable to suffer from vesical hemorrhage, especially after rough exercise in a carriage or on horseback. Worms, accidentally lodged in the bladder, have been known to cause profuse and even fatal loss of blood. Venereal excesses, violent concussion of the body, and severe exercise on horseback, may be enumerated as among the more common causes of the affection. Van Swieten¹ records the case of a riding-master, who, soon after an attempt to break a stubborn horse, discharged not less than eight pounds of blood in a few hours.

Ulceration of the bladder is nearly always accompanied by bleeding; and one of the most characteristic signs of papillary fibroma and open carcinoma of the viscus is a persistent and considerable hemorrhage, which is liable to be aggravated by examinations with instruments.

Varices of the bladder occasionally give rise to hemorrhage; sometimes slight, at other times copious; now of short duration, now long-continued. An instance occurred at the Hôtel-Dieu in Paris, in the service of Professor Laugier,² in which the bleeding was so profuse as to prove fatal. The patient, who had some time previously labored under acute myelitis, with paraplegia, had been in the house several days, on account of a bony tumor, when the attack came on. The blood was of a dark color, and was voided perfectly pure, without any admixture of urine. Catheterism failed to detect any appreciable lesion in the bladder, which was much distended, and pushed high up into the abdomen. The hemorrhage continued to recur at intervals, sometimes slightly, at other times copiously, until the man sunk from exhaustion. The autopsy revealed the existence of several large varices at the neck of the bladder, upon one of which was a large ulcer, from which the bleeding had evidently proceeded. The organ was perfectly sound in other respects.

A peculiar form of hemorrhage of the bladder, indigenous to Egypt and Africa, and probably of dietetic origin, is the endemic hematuria which depends upon the presence of an

¹ Comment in *Aph. Pat.*, 1422, p. 251.

² *Gaz. des Hôp.*, No. 81, 1854, p. 321.

entozoon, known as the *Bilharzia Hematobia*, in the small veins of the mucous and other tissues of the organ. At the points in which the eggs of the worm are embedded, the lining membrane is congested and ecchymosed. The ova and embryos, as well as the fully-developed parasites, can be detected in the urine and in the blood which usually flows after the bladder is emptied. Sometimes small clots or bloody mucus, presenting the same characteristics, are discharged.

When recently effused into the empty bladder, the blood is of a natural appearance; but if it has been retained for some time, or been diffused through the urine, it assumes a smoky, or dark-brownish hue, not unlike porter, or the sediment of beef-ten. In some instances, especially when it is pent up for a long time, it is of the color of tar or molasses. It is generally liquid when the discharge is recent, but coagulated when it is of several hours' standing. Complete coagulation seldom takes place, except in the traumatic form of the affection, in connection with an empty or partially empty bladder. These changes in the color and consistence of the effused blood are owing to the chemical action of the urine on the blood corpuscles. When the urine is neutral or alkaline, the color is of a florid-red; but when the reaction is acid, it is of a smoky or brownish tint.

The most important, because the most characteristic symptom of vesical hemorrhage, is a discharge of blood from the urethra, either alone or in combination with the urine, and accompanied, if the quantity be at all considerable, by a frequent desire to micturate, spasm at the neck of the bladder, and a burning sensation along the course of the urethra. When the blood coagulates nearly as fast as it is poured out by the bladder, it may lead to retention of urine, either partial or complete, temporary or permanent. Copious effusions of this kind may be followed, sooner or later, by all the symptoms of exhaustion.

Hemorrhage of the bladder is liable to be mistaken for hemorrhage of the kidneys, the ureters, prostate gland, and urethra; and it need, therefore, hardly be added that the diagnosis is sometimes difficult, if not impracticable. In case of direct injury of the bladder by wound, calculus, or instrument, there need be no room for doubt. The nature of the lesion is sufficiently obvious. In the idiopathic form of the hemorrhage, however, great uncertainty must frequently exist. Under such

circumstances, the history of the case, and the absence of disease or injury of the associated organs, may assist in clearing up the difficulty, and leading to a correct diagnosis.

When the bleeding proceeds from the kidneys, it may depend upon external injury, temporary congestion, inflammation, calculi, carcinomatous, sarcomatous, or villous tumors,¹ parasites, and tubercle; or it may be symptomatic of cold, miasm, and certain constitutional disorders, as purpura and the eruptive fevers. The blood is usually intimately mixed with the urine, imparting to it a smoky tint; while the urine itself has an acid reaction, and contains blood casts. Pure blood may follow laceration of the kidney, with rupture of the renal artery; or a few drops may pass, after the discharge of clear urine, in villous disease, which has only been met with in old subjects, and in which the passage of clots along the ureter may produce symptoms that are indistinguishable from those due to the passage of a renal calculus. Malignant growths are characterized by the presence of a prominent lobulated tumor in the loin, usually of the right side, and rapid breaking down of the general health. Intermittent or paroxysmal hematuria, which is due to temporary congestion of the vessels of the Malpighian bodies, from exposure to cold or malaria, is marked by the rapidity with which blood appears in the urine, after an attack of shivering or feeling of chilliness. The urine is acid, little disposed to decompose, of a deep claret or porter color, and deposits a dark sediment, which consists principally of hematin granules, few, if any, blood corpuscles, urea, and granular casts. When the hemorrhage depends upon the presence of the *Bilharzia Hematobia*, the ova and embryos may be detected in the urine. Acute and chronic albuminous nephritis are marked by dropsy, and scanty and smoky urine, which contains epithelial cells, casts, and cylinders, and hyaline, blood, granular, and fatty casts. From whatever cause it may arise, the bleeding is liable to be preceded and accompanied by symptoms referable to the kidneys, such as aching, heat, and pain in the loins, and retraction of the testes.

Hemorrhage of the ureters is generally produced by the presence of a calculus, the passage of which lacerates the vessels

¹ Trans. Path. Soc. of London, vol. xxi., 1870, pp. 239-244.

of their lining membrane, and gives rise to sudden and violent pain, extending to the back, groins, inside of the thighs, and end of the penis, intermittent in its character, and attended with retraction of the testes, distressing nausea, vomiting, cold sweats, and a sense of excessive prostration, and even faintness. The passage of coagula may also give rise to a paroxysm of nephritic colic.

In vesical hemorrhage, the larger portion of the blood is discharged towards the completion of micturition, or a moderate quantity of florid blood is passed after the last drops of urine. If it depends upon a calculus, the amount is increased after rough exercise, and exploration with the sound usually suffices to establish the diagnosis; while if it is due to a parasite, the ova and embryos may be detected in the urine. The loss of blood from a papillary fibroma is a constant or frequently recurring symptom without any obvious cause, unless a fragment of the growth can be detected in the urine, and is usually preceded by signs of vesical irritability. The blood is generally mixed with the urine, or is passed in a liquid state at the completion of micturition; although, in exceptional instances, it may flow before the urine. Hemorrhage from inflammation or ulceration of the bladder is characterized by the usual symptoms of these affections, and the coincident discharge of pus and mucus.

In chronic prostatitis, the passage of blood with the last drops of urine, along with cylindrical moulds of pus-containing mucus, and tenderness on rectal exploration, suffice to determine the diagnosis.

Urethral hemorrhage is generally produced by acute inflammation, instrumental contact, external violence, the passage of a calculus, or the venereal orgasm; and the blood, whether it be fluid or clotted, precedes the discharge of urine. It should, however, be remembered, that in hemorrhage of the urethra, the blood may regurgitate into the bladder, where, uniting with the contents of that viscus, it may assume the aspect and consistence which belong to the blood of vesical hemorrhage. In exceptional cases of villous tumors seated at the neck of the bladder, pure blood may precede the urine.

A source of the discharge of blood from the urethra, as rare as it is interesting, is laceration of the deferent duct, of which occurrence Mr. Hilton has met with three examples.¹ After a

violent strain or blow, something was felt to give way in the right groin, which was accompanied with immediate pain, and at once followed by a flow of blood from the urethra. The introduction of the catheter showed the urine to be perfectly clear; and a day or two afterwards, each patient had a tender swelling of the spermatic cord in the inguinal canal.

Great assistance in the diagnosis of hematuria may be derived from the inspection of any clots that may be passed, to which particular attention has been directed by Mr. Hilton.¹ By floating out the coagula in water, so that they may unravel, they will be seen to have assumed the configuration of the part in which the blood was effused. In this way they form moulds or casts of the pelvis of the kidney and ureter. Of the latter occurrence, a noteworthy example is recorded by Dr. Hyde Salter.² The cylindrical clot, which was mistaken for a worm, was six inches long, pointed at each extremity, and coiled up.

In a remarkable case, recorded by Dr. T. B. Reed,³ large quantities of worm-like clots, from two and a half to three and a half inches in length, by one or two lines in diameter, were passed during an attack of acute nephritis. The blood, however, was of renal origin, as demonstrated by post-mortem inspection, and coagulated in the ureter, the lumen of which was constricted by coagulated blood, the result of rupture of the kidney, encircling its exterior.

Vesical clots are distinguished by their irregular circular and flattened shape, and bevelled and serrated edges. Long, perfectly round coagula, passed before the urine, indicate hemorrhage of the urethra anterior to its prostatic portion. Clots from the latter locality are of a leech-like or ovoid configuration in their long axis.

In the treatment of vesical hemorrhage, attention must be paid to the nature of the exciting cause, which must necessarily, in all cases, exert a controlling influence in regard to our therapeutic agents. In the traumatic variety, the ordinary hemostatics are, of course, indicated, and should be employed without delay. When the bleeding depends upon the presence of a

¹ Guy's Hosp. Rep., vol. xiii., 1867, p. 24.

² Ibid., pp. 19-28.

³ Trans. Path. Soc. Lond., vol. xi. p. 164, and plate 4, fig. 8.

⁴ Trans. Path. Soc. Philada., vol. v., 1876, p. 142.

foreign body, it should be removed. Papillary fibroma should be reached by cystotomy, or, in the female, by rapid dilatation of the urethra. If an operation be deemed undesirable in this form of hemorrhage, or in idiopathic bleeding, palliation alone is attempted. The most important remedies, of which a full account is given at page 148, are recumbency, cutting off the supply of drinks, milk diet, opium, acetate of lead, gallic acid, tincture of ergot, tincture of the chloride of iron, and cold applications to the perineum, hypogastrium, or a lump of ice inserted into the rectum. The catheter is carefully avoided. Should retention of urine ensue, the treatment is that laid down at page 115.

CHAPTER VIII.

STONE IN THE BLADDER.

SECT. I.—NATURE AND CAUSES.

Most urinary calculi originate in the kidneys, from which they descend into the bladder, where, if they are retained for any length of time, they gradually increase in size, and ultimately produce more or less obstruction. The elements of the urine, on the other hand, may be precipitated in the bladder, instead of in the secreting substance of the kidney; or they may aggregate around a foreign substance in the bladder. When the calculus has a nucleus of uric acid or oxalate of lime, the probability is that it had a renal origin; but vesical, if it is phosphatic.

Stone in the bladder occurs at all periods of life, from the most tender infancy to the most decrepid old age. Indeed, there is reason to believe that it occasionally exists as an intrauterine affection, of which Langenbeck met with an example in a six months' male foetus.¹ Geyer² relates the case of a boy who suffered from calculus of the bladder from birth. He was cut in his twelfth year, when the stone had acquired so large a bulk that it had to be broken before it could be extracted. The whole mass weighed ten ounces. Stahl³ found a calculus of the size of a peach-kernel in an infant of three weeks that had suffered great distress from its birth in passing its water. Similar examples are mentioned by Nicolai, Armstrong, Richel, Greding, Nosäus, Norris, and others.

That calculous disorders are most common in young subjects, however, may be seen from the subjoined statistics, which show that more than one-third, or 40 per cent., occur before the tenth year, and more than one-half, or 58 per cent., before the twentieth year. The disease is, therefore, most common in infancy, childhood, and adolescence.

¹ Coulson, *Diseases of the Bladder and Prostate Gland*, p. 418, London, 1857.

² *Miscel. Nat. Curios.* Dec. 11, An. V. p. 456.

³ *Diss. De Morb. Foetuum in Utero Materno*, S. 6.

Table showing the ages of 8574 Calculous Patients.

	English Hospitals. ¹	Sarabunpore Dispensary. ²	Penn's Hospital. ³	Moscow.	Civiale. ⁴	Total.
From 1 to 10 years,	815	294	38	305	2046	3498
" 10 " 20 "	289	123	18	115	943	1488
" 20 " 30 "	97	150	9	32	460	748
" 30 " 40 "	89	102	6	11	230	438
" 40 " 50 "	108	81	5	3	391	588
" 50 " 60 "	213	55	2	2	413	685
" 60 " 70 "	178	16		1	577	773
" 70 " 80 "	37	2			299	338
" 80 " 90 "	1	1			17	19
	1827	824	78	469	5376	8574

In attempting to form a correct estimate of the relative frequency of vesical calculus in children, adults, and old persons, we must not lose sight of the fact that many of the cases which fall into the hands of the surgeon are examples of long standing, extending, perhaps, through a period of many years. Thus, it often happens that a youth of fifteen is cut for a stone developed in infancy; that a person of twenty-five has carried a calculus since the age of ten; and that an old man has a stone which began to form in middle life. Indeed, it may be assumed, as a general rule, that a number of years usually intervene between the manifestation of the first symptoms of stone in the bladder and the extraction of the same stone by operation. Moreover, it should be borne in mind that calculous diseases are more frequent, in certain countries, among children than among adults, and conversely. Thus, the greater number of stone cases in Wirtemberg, in the mountains of Switzerland, the Neapolitan States, and in some of the counties of England, especially Norfolk, occurs in young persons, from causes hitherto unexplained. In Kentucky, lithotomy is performed much more frequently upon children under fifteen years of age than upon adults.

¹ Sir Henry Thompson, *Practical Lithotomy and Lithotrity*, 2d ed., p. 275. The table includes the lateral operations of lithotomy practised at the Norwich, Oxford, Birmingham, Guy's, St. Thomas's, University, and Addenbrooke's Hospitals, and the Leicester and Leeds Infirmaries.

² Dr. Garden, *Indian Annals of Medical Science*, No. xxiii., 1868, p. 20.

³ Dr. Morton, *Pennsylvania Hosp. Rep.*, vol. ii. pp. 42-43.

⁴ The cases embraced in Civiale's list occurred in France, Austria, Bavaria, Bohemia, Dalmatia, Saxony, Denmark, Lombardy, Egypt, and other countries.

Certain facts seem to warrant the inference that this affection is hereditary. Thus, Civiale relates the case of a man on whom he practised lithotrity whose mother had had stone, and one of whose children died of it. He also performed the operation on two brothers, whose grandfather and two uncles had labored under the disorder. Prout speaks of a family in which the father, son, and grandson were all affected with uric acid calculi.

It has been long known that calculous diseases are much more common among the poor than the rich. This remark is true, there is reason to believe, of these two great divisions of society in all parts of the world where these complaints prevail. Upon what this difference depends is not positively ascertained; but the probability is, that it is mainly due to derangement of the digestive organs, engendered by the use of unwholesome food, by irregular habits, want of cleanliness, intemperance, and deficient clothing.

Vesical calculus does not occur with equal frequency in all countries. Thus, in the United States, it is, so far as is at present known, by far more common in Kentucky, Virginia, Tennessee, and Ohio, than in any other portions of the Union. Missouri, Indiana, Maryland, Pennsylvania, and Northern Alabama, also furnish a considerable number of cases. On the other hand, calculous disorders are comparatively infrequent in New York, Georgia, the two Carolinas, Florida, Louisiana, Mississippi, Arkansas, Iowa, Wisconsin, Illinois, Texas, Mexico, and California. In New Jersey, Delaware, and the New England States generally, stone in the bladder is proverbially rare. The malady is also uncommon in Canada and the other British Provinces of North America. The causes of these differences have not been ascertained; attempts have been made to trace them to the effects of climate, and to the influence of the water, food, and habits of the people, but without success.

With regard to the influence exerted by race upon the production of stone, our information is meagre. The disease is very common among the rice-eating natives of India; and the reports of the resident missionary physicians show that the Chinese are not so exempt from it as was formerly supposed. The different varieties of the negro race of this country are much less subject to vesical calculus than the whites. In a former edition of this work, I gave a table of the relative fre-

quency of stone among the white and colored residents of the United States, which was based upon 443 cases of lithotomy, occurring in Kentucky, Virginia, Tennessee, Georgia, Alabama, Louisiana, and Missouri, from which it appears that only 63, or 14.22 per cent. of operations were practised on the negro and mulatto, while six times that number were done in whites.

In Egypt Professor Reyer states that the disease is unknown in the negro race, while it is very prevalent among the Arabs; and it would appear, from the writings of Dr. Livingstone, that the negroes of Central Africa are entirely free from the affection.

Urinary calculi are much more frequent in men than in women, in the proportion of about 20 to 1, because, in the first place, they are more constantly exposed to the exciting causes of the complaint, and affections which obstruct the ready flow of the urine; and secondly, because of the more complicated structure of the urinary apparatus, which prevents the ready discharge of sabulous matter, and thus favors the formation of stone. But for the latter circumstance, the probability is that young girls would suffer nearly as often as boys.

What influence, if any, occupation exerts upon the production of this disorder, we have no statistical facts to determine. In Ohio, and in the southwestern States, especially Kentucky and Tennessee, the great majority of calculous subjects are common laborers, farmers, and mechanics, or the sons of persons of this description; and the same is true, I suppose, of the calculous cases in the other States. Persons who are habitually exposed to cold and wet are said to be particularly prone to this complaint; the fact, however, if it be one, requires confirmation before it can be received as true. Seafaring people are remarkably exempt from urinary calculi, and a similar immunity seems to be enjoyed by soldiers.

Climate, doubtless, exercises no little influence in the formation of urinary concretions. It has been already stated that, in the United States, this disease is most common in Ohio, Kentucky, Tennessee, and Virginia; a circumstance which, so far as is known, does not depend upon any peculiarity of living, and which may therefore be supposed to be owing to some mysterious operation of the climate. In Holland, calculous disorders are very common, and the circumstance is the more remarkable because of the great use that is made there of gin, which is a powerful

diuretic. That this liquor is not the cause of this occurrence is proved by the fact that the Dutch colonists of Batavia, in the island of Java, whose habits are not at all dissimilar from those of the people of the mother country, are almost entirely exempt from this affection. Sæmmering states that the disease is altogether unknown in some situations bordering on the Rhine.¹ Calculous affections are much more common in Manchester and its vicinity than in any other part of England, and yet the habits of the residents there are the same as in other places. They are more frequent in England than in Scotland, and in Scotland than in Ireland. The same is true of Russia. In the central districts of the Empire, watered by the upper tributaries of the Volga, calculous disease is very common, while it is extremely rare in the northern, southern, and western portions. In the Punjab, northwestern, and central provinces of India, it is very prevalent, 554 cases of lithotomy having occurred in six months of 1863. In Lower Bengal, on the other hand, stone is not very frequent, as Professor Fayrer² states that only about one hundred patients were cut in the Medical College Hospital in eleven years. It is very frequent in France, Germany, Persia, and Egypt, its production in the last country depending, in some measure at least, upon inflammation of the bladder from the presence of the *Bilharzia Hematobia* in its mucous coat. In Hungary the disease is infrequent, and it is principally met with in the children and young adults of the peasant and artisan classes.

Certain kinds of food predispose to the formation of calculous disease. All articles which have a tendency to create acidity and flatulence, must exert a deleterious influence upon the renal secretion, changing its properties, and promoting the deposition of earthy matter. How far the constant use of hot bread, biscuit, and pastry, which are consumed in such enormous quantities in this country, especially in the southwestern States, conduces to bring about calculous disorders, we have no means of deciding. That the daily employment of these articles has a tendency to wear out the strongest stomach, and to break down the most vigorous frame, does not admit of doubt. What the effects of such a state of the system must be upon the urinary secretion,

¹ Coulson, *op. cit.*, p. 399.

² *Clinical and Pathological Observations in India*, 1873, pp. 385 and 391.

every pathologist knows. A weakened digestion, with a sour and flatulent state of the stomach, constipation of the bowels, and an irritable condition of the brain, cannot by any possibility produce a healthy blood, any more than a morbid state of the blood can produce a healthy urine. It has been supposed that the use of corn bread and bacon predisposes to the development of calculous disorders. That such may be the case is possible; but the fact, if it be one, remains to be established. The negro of the southwest, who employs hardly any other kind of bread, and whose principal meat is salt bacon, is remarkably exempt from this class of diseases; and it is also well known, at least to the practitioners of that region of country, that a great many of the calculous patients there are young children who are seldom sufficiently fond of corn bread to make it their principal food. In Ohio, where stone is perhaps nearly as frequent as in Kentucky, but little corn bread is used, while in the latter State it forms, in many families, the principal table diet. In Norfolk, England, where calculous complaints are exceedingly frequent, corn bread, as an article of food, is unknown.

What influence, if any, the inordinate use of tea and coffee exerts upon the production of this disease, is not ascertained. Unripe beer and wine seem to favor the development of uric or oxalic concretions; while good Rhenish wines have the reputation of being excellent prophylactics against this class of affections. The bitartrate of potassa, which most of these wines contain in large quantities, is supposed by Liebig to be changed in the progress of digestion into the carbonate of potassa, which produces an alkaline effect, and thus counteracts the tendency to the deposition of lithic acid. Dr. Dobson remarked, three-quarters of a century ago, that calculous disorders are much more frequent in the cider counties than in other parts of England. The fact, if it be one, may, however, be a mere coincidence; for it is very certain that nearly all sections of the United States where cider is used in greatest abundance, are eminently free from this class of affections. In New Jersey, and in certain parts of Pennsylvania, New York, and New England, the article is drunk in large quantities, and yet it is very uncommon in these localities to see persons suffer from stone in the bladder.

Many respectable writers and practitioners are of the opinion

that the production of calculous diseases is promoted by the use of hard, impure water, in consequence of the changes which it is supposed to induce in the renal secretion. The opinion is plausible, and may be true, but how far, or to what extent no one has attempted to decide. If it be true that in Kentucky, Virginia, Alabama, Tennessee, and Ohio, most calculous cases occur in limestone regions, it is equally true that many are found in the freestone districts of those States.

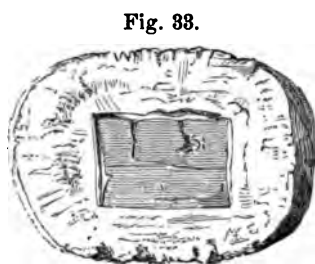
The formation of stone is often remarkably favored by stricture of the urethra, enlargement of the prostate gland, organic disease of the bladder, and cystitis following paralysis of the viscus from local or general causes. Whatever, in fact, has a tendency, for any length of time, to obstruct the flow of urine, or change the character of this fluid, whether during its secretion or after its arrival in the bladder, may be looked upon as a predisposing cause of this disorder. If the urine happen under these circumstances to be at all surcharged with earthy salts, or even where it contains merely its normal proportions, more or less of these substances is liable to be retained in the bottom of the viscus, where it serves afterwards, in many instances, as the nucleus of a calculous concretion. This liability is greatly increased when there is habitually, along with the mechanical obstruction, an inordinate secretion of mucus. It has long been known that gout and rheumatism are eminently conducive to the formation of uric acid calculi.

SECT. II.—PHYSICAL AND CHEMICAL PROPERTIES.

Most calculi have a central nucleus, upon which the organic or inorganic elements of the urine accumulate or aggregate. This nucleus may be formed by any substance, whether generated in the urinary organs, or introduced from without. In the great majority of cases, it consists of uric acid, its allies or modifications, as is seen from the subjoined table of the analysis of 1613 calculi, in all of which, save 189, the organic elements of the urine formed the starting point of the nuclei. The table at the same time affords an opportunity of instituting a comparison between the constitution of calculi of different countries. Concretions formed upon foreign bodies are omitted.

	1	2	3	4	5	6	7	8
Uric acid	81	51	6	17	278	..	95	20
Urate of ammonia...	23	35	88	24	201	} 128	15	10
Other urates	55	7	..	..	..		..	3
Oxalate of lime	72	27	14	3	95	47	16	43
Cystic oxide	..	2	2	..	3	11	..	..
Xanthic oxide	..	..	..	..	1	1	..	..
Phosphates	19	52	8	1	71	22	1	9
Carbonate of lime ..	..	4	..	..	..	..	..	2
Total	250	178	68	45	649	209	127	87

Sometimes, although rarely, the nucleus is composed of inspissated mucus, lymph, epithelium, coagulated blood, or the ova of entozoa. Occasionally, again, the concretion is formed around a foreign body, introduced either by the patient himself through design or accident, or in the same manner by a second party. A person shot in battle has been known, at a subsequent period, to suffer from stone in the bladder, in consequence of the ball having lodged in that organ, and thus invited, as it were, a deposit of calcareous matter. A surgeon may become the innocent cause of a similar occurrence. In treating a diseased urethra, or in exploring this canal, the bladder, or the prostate gland, the catheter, bougie, or sound which he uses may break off, and afterwards lead to the development of a stone. Many such cases are upon record. A great variety of substances, as nails,



Calculus with Nucleus of Cork.

tacks, bullets, needle-cases, fruit-stones, peas, beans, pebbles, tents, hairs, small keys, pipe-stems, bits of candle, glass tubes, grass-stalks, pieces of straw, barbs of wheat, cork, human teeth, rings, pins, and needles, have been accidentally lodged in the bladder, by patients endeavoring to relieve stricture, to procure evacuations of urine, to ex-

¹ Sarahunpore Dispensary, India, Dr. Garden.

² MS. Catalogue of Mütter Museum, College of Physicians of Philadelphia, Dr. Bridges.

³ Museum Med. Dep't Transylvania University, Kentucky, Dr. Peter.

⁴ Warren Museum, Med. Dep't, Harvard College.

⁵ Museum of Royal College of Surgeons in London.

⁶ Museum of Guy's Hospital, Dr. Bird.

⁷ Principally Musée Dupuytren, Dr. Bigelow.

⁸ Collection of Professor Reyer, of Cairo, Egypt.

cite onanism, or create public sympathy. Examples of this kind are, for obvious reasons, more common in the female than in the male. In my private collection are specimens in which the concretions were formed around the tail-bones of a squirrel, an elm bougie, a piece of lead-pencil, a bullet, and a needle. The nucleus is sometimes composed of hair, bones, or teeth, derived from a dermoid tumor which has evacuated its contents into the bladder. In the annexed drawing, fig. 33, taken from a preparation in the cabinet of Dr. Sabine, of New York, it consists of a piece of cork.

Finally, the nucleus varies much in size, color, form, and consistence. Although generally single, it is sometimes double, triple, and even quadruple; its situation is not always strictly central. The instances in which the concretion is hollow, or the nucleus loose, are rare.

Calculi vary much in their number. In general, there is only one; now and then there are two or three; and sometimes, although rarely, there are several dozens, or even several hundred. The largest number I have ever found was fifty-four, which I removed from the bladder of an old gentleman, upwards of seventy-six years of age. They were of a dull whitish color; smooth, irregular in their shape, and from the size of the kernel of a filbert to that of a common marble. The most extraordinary example upon record occurred in the practice of the late Dr. Physick, who extracted from Judge Marshall, of the Supreme Court of the United States, upwards of one thousand uric acid calculi, from the size of a partridge shot to that of a bean. They were all of an oval shape, and were marked each by a small black spot.¹

The mulberry calculus is almost always solitary; and the same is true, but not to the same extent, of the uric acid calculus. The phosphatic calculus, on the contrary, is not infrequently multiple. When the concretions are numerous, they are always proportionately small, and more or less smooth on the surface, or provided with facets, from the constant friction which they exert upon each other in the bladder. On the other hand, solitary stones are generally rough, and comparatively large.

The volume of urinary concretions ranges between a hemp-seed and a cocoa-nut. In the great majority of instances it does not

¹ Gibson's Institutes of Surgery, ii. p. 220. Fifth edition.

exceed that of an almond, a pullet's egg, or a walnut, the latter of which, indeed, it seldom reaches. In young subjects, and in recent cases generally, the size is usually inconsiderable. I have a number of calculi, extracted from children from three to five years of age, which, in their volume, hardly equal a common marble. The size of a urinary concretion, however, does not necessarily depend upon the period of its sojourn in the bladder, or the age of the patient. Occasionally it increases very rapidly, so as to attain a considerable bulk in a very few months; and, on the other hand, it may remain small for many years. In 1844, I operated upon a man twenty-six years old, who had labored under well-marked calculous symptoms from his earliest infancy, and yet the stone was hardly as big as a hen's egg.

The chemical constitution appears to exert no inconsiderable influence upon the volume of urinary concretions; thus, the ammoniaco-magnesian and the fusible calculi are capable of attaining a very large size, while the uric, oxalic, cystic, xanthic, and fibrinous, are almost always comparatively small, no matter what may be their own age or the age of the patient. This fact is of value in a practical point of view; because, by ascertaining the calculous diathesis of the sufferer, a tolerably correct idea may be formed as to the volume of the stone under which he is laboring. It is interesting to note, however, that in a case recorded by Mr. Williams, a uric acid calculus, which weighed twenty-five ounces, and measured ten and a half inches in its short circumference, and twelve and a half in its long circumference, was removed, after death, from the bladder of a gentleman, eighty-one years of age.

It has been already seen that, when urinary calculi coexist in great numbers, they are always proportionately small. In the most remarkable case of this kind upon record—that of Judge Marshall, previously referred to—the size of none of the concretions, which amounted to upwards of one thousand, exceeded that of a bean, while many of them were not larger than a partridge shot. It is worthy of remark also, that, under these circumstances, the individual calculi are generally of unequal dimensions.

The consideration of the weight of urinary concretions is necessarily connected with that of their volume. In general, this does not exceed a few drachms or ounces. Out of every one hundred calculi, as they occur in the cabinets of different institu-

tions, or of private individuals, few will be found to weigh more than five or six drachms. One of the smallest ever removed by lithotomy, weighed only ten grains; the operator was Mr. Martineau, of England, and the patient a boy, thirteen years old. In one of my own cases, that of a boy, six years of age, the weight of the calculus was only five grains. Many examples, however, are recorded of four, six, eight, ten, twelve, fifteen, and even sixteen ounces. Instances of eighteen, nineteen, and twenty ounces, are related by Borellus, Lusitanus, Cheselden, Pauw, Foschini, Wrisberg, and Sandifort. Fabricius Hildanus describes a calculus which weighed twenty-two ounces, and was four inches and a half in length, by three and a half in breadth. Examples of from twenty-four to thirty ounces are recorded by Deschamps, Pauw, Paget, Tolet, Williams, King, and other authors. In the case mentioned by the latter,¹ the patient, who was forty-six years of age, had suffered from his infancy, and the stone was seven inches and a half long, by fifteen inches in circumference. Several instances exist in which the concretion weighed thirty-five, forty, forty-five, and even fifty ounces. Mr. Henry Earle,² of London, has published the particulars of a calculus which weighed forty-four ounces, and was sixteen inches in circumference. It was impossible to break it, and the operator was compelled to leave his task unfinished. Deschamps gives a case of fifty-one ounces; Verduc, one of three pounds three ounces; and Kesselring³ one of upwards of six pounds.

Not a little diversity obtains in respect to the consistence of vesical concretions. As a general rule, it may be said to vary from that of semiconcrete mortar, chalk, or wax, to that of stone or marble. The hardest calculi are the oxalic and uric, which generally emit a clear sound when struck with steel, and cannot be fractured without a considerable degree of force. Calculi, on the other hand, composed of ammoniaco-magnesian phosphate and phosphate of lime, are friable, and easily reduced to powder. In extracting such concretions from the bladder, they not infrequently break under the pressure of the forceps. The cystic and fibrinous calculi are quite soft, the latter scarcely equalling that of yellow wax. It often happens that one part of a stone is hard

¹ London Medical and Physical Journal for 1828.

² London Medico-Chir. Trans., vol. xi. p. 82.

³ Commer. Liter. Norimb. 1739, hebd. 9.

and compact, while another is soft, friable, or even pulverulent. This diversity of consistence is strikingly exhibited in what are denominated the alternating calculi, and seems to depend, in great measure, if not entirely, upon the component elements of the different layers of which such concretions consist. It is not improbable that the age of a stone may exert some influence upon its consistence, though it is impossible to estimate the amount or degree of it.

Stones are occasionally composed of a mixture of sabulous matter and hair, more or less intimately matted together. Their consistence resembles that of old lath-plaster; they are easily crushed or pulverized, and they are of a whitish, grayish, or pale-drab color. Their formation is of rare occurrence, and they appear to consist principally of phosphate of lime and magnesia, aggregated on hair derived from dermoid cysts, or introduced from without.

The color of these bodies is not less variable than their other physical properties. The most common shades are white, grayish, drab, fawn, reddish, rose, and brown. Concretions of a bluish, greenish, black, or slate color are rare. In the alternating calculi, a combination of tints is generally observable, and even one part of the surface of a stone may differ essentially, in this respect, from another. The cystic and fibrinous calculi are of a yellow color, not unlike that of yellow wax; the phosphatic are whitish or grayish; the oxalic, dark or blackish; the uric, rose, reddish, or brown.

Most calculi, at the moment of their extraction from the bladder, and for a short time afterwards, emit a strong urinous odor, which they gradually lose by exposure to the atmosphere. It may also be completely destroyed by ablution in warm water, and rapid desiccation before the fire. More or less, however, of the animal matter is usually retained, so that maceration at any future time, if not too remote, is apt to be followed by a slight reproduction of the original odor. When sawed, rasped, or rubbed, urinary concretions give out a smell similar to that of bone, horn, or ivory. Fourcroy considered the spermaceti odor furnished by mulberry calculi, thus treated, as characteristic of the species; this, however, is a mistake.

Vesical calculi are capable of assuming a great variety of forms. The circumstances which are chiefly concerned in producing this result are the action of the bladder, the friction

which the concretions, when multiple, exert upon one another, and the nature of the nucleus. They are commonly of an oval outline, but occasionally they are round, spherical, or even cylindrical. Other varieties of form are sometimes seen, as the conical, pyriform, cubic, triangular, pyramidal, gourd-like, polygonal, and the tetrahedral. Sometimes the concretion is thin and flat, like a coin, lenticular, semilunar, or in the shape of a mushroom, a kidney, a mulberry, a bean, or a heart. Again, it may be large and bulbous at the extremities, and narrow at the middle, like a dumb-bell. Dr. Mussey, Professor of Surgery in the Miami Medical College, Cincinnati, showed me, some years ago, a most singularly shaped calculus, represented in fig. 34, which had been removed after death from the bladder of a man who had long labored under disease of that organ. It is of a light-brownish color, and consists of a central portion and a number of distinct processes, each of which has a small cavity containing animal matter. The processes are remarkably rough, and several of them are nearly half an inch in length. Its composition is supposed to be oxalate of lime.

Fig. 34.



Thorny Calculus.

Large concretions occasionally assume the form of the bladder, and even send prolongations, points, or processes into the urethra, the ducts of the prostate gland, and the ureters. A remarkable specimen of this nature was presented to the Pathological Society of London, by Mr. Furneaux Jordan,¹ in 1867. A triple phosphate calculus formed a mould of the apex, body, base, and trigone of the bladder, the openings of the urethra and ureters, and was the seat of a circular depression caused by a hypertrophoid band of muscular fibres. In the case from which the annexed sketch, fig. 35, was taken, the calculus was lodged partly in the urethra and partly in the bladder, in the former of which it reached as far forward as the bulb; it was cut out of a lad in St. George's Hospital, London, and was composed almost entirely of the mixed phosphates.² "In its appearance, it is not unlike the head and part of the neck of a turkey-poult, when prepared for the spit."

Occasionally, again, the concretion consists of several pieces

¹ Trans. Path. Soc. London, vol. xviii. p. 179.

² Bromfield's Chir. Observations and Cases, vol. ii. plate 10.

which are, as it were, articulated with each other, as in the remarkable specimen represented in fig. 36, copied from Palluci.¹ In this case, one of the pieces projected into the scrotum and

Fig. 35.



Fig. 36.

Fig. 35. *a.* The urethral, and *b.* the vesical portion.Fig. 36. *a.* Urethral portion; *b.* the scrotal, and *c.* the vesical.

another into the urethra, while the third, or smallest one, lay in the cavity of the bladder. The calculus, which weighed four ounces and a half, and was nearly cylindrical in its form, was three inches and three-quarters in length by an inch and a half in thickness. The engraving is about one-half the natural size.

Sometimes several concretions are matted together, so as to form what, in geological language, is termed a pudding-stone.

Fig. 37.

Pudding-Stone
Calculus.

I have never seen an instance of this kind; but a beautiful specimen, represented in fig. 37, is described by Professor Erichsen, in his treatise on surgery. It was removed by him from a child, and consists of eleven distinct lithic acid calculi soldered together by earthy matter.

Morgagni speaks of a stone, voided by a female, which was perforated at the centre. Sometimes a calculus is very porous, or marked by numerous apertures, as if

¹ *Lithotomie Nouvellement Perfectionnée*, p. 58. Vienna, 1757.

it had been exposed for a long time to the action of the urine. In a word, there is literally no end to the grotesque appearances of these bodies.

Finally, the shape of a calculus, as already stated, is sometimes materially influenced by that of its nucleus. If this be long, as when it consists of a piece of catheter, bougie, straw, or flower-stalk, the concretion will also be apt to be long and slender, the reverse being the case when the nucleus is rounded, or ovoidal. The fact is interesting in regard to the manner in which the foreign body should be seized with the forceps, with a view to its removal from the bladder, whether this be attempted by incision, or the natural channel.

The surface of these concretions may be smooth or rough. The former is generally the case when several exist together, from the friction which they exert upon each other; when there is only one, however, it is almost always rough. From the cause just mentioned, multiple calculi may not only be smooth, but even highly polished, and rendered angular, polygonal, rhomboidal, or tetrahedral. The oxalic concretion derives its common name from the roughness of its surface, which resembles that of the fruit of the mulberry. The uric acid calculus is usually finely tuberculated. In some of these foreign bodies, the surface is scabrous, mammillated, knotty, convoluted, or covered with spines, prongs, or stalactites.

That urinary concretions vary very much in their chemical constitution in different localities, is evinced by the table given at page 172. The oxalate of lime calculi in the Grant Medical College Museum at Bombay amount to 38.65 per cent.; in Guy's Hospital, London, to 22.59 per cent.; in the Royal College of Surgeons to 14.72 per cent.; and in the Norwich Hospital to 13.27 per cent. Uric acid calculi occur in smaller proportions in India than in England; and as to phosphatic calculi they reach only 3.36 per cent. in the former, while they amount to 10 per cent. in the latter.¹ In Egypt, pure phosphatic concretions are almost unknown, and oxalate of lime calculi amount to only 12.5 per cent. Dr. A. H. Hassall, of London, states that of 1000 calculi, 372 consisted of uric acid, either pure or mixed with small quantities of the urates or oxalate or phos-

¹ Carter's account of Calculi in India, as quoted in Beale's Archives of Medicine, No. 6, p. 142, 1860.

phate of lime; 253, chiefly fusible concretions, of the earthy phosphates; 233 of varying layers of uric acid, oxalate of lime, and earthy phosphates; and 142 of oxalate of lime.

The subjoined account, which is transferred, with little alteration, from my work on Pathological Anatomy, includes the most important species of urinary concretions that have hitherto been described.

The uric, or lithic, acid calculus, the most common species of all, forming as it does about one-fourth or one-fifth of all calculi, was first noticed by Scheele, in 1776. In its color it is brownish, inclining to that of mahogany, of a flattened oval shape, occasionally finely tuberculated on the surface, but most generally smooth, although not polished, unless there are several concretions at the same time, and from the size of a currant to that of a hen's egg. When divided, it will be found to consist of several layers arranged concentrically around a common nucleus, the laminae being frequently distinguishable from each other by a slight difference in color, and sometimes by the interposition

Fig. 38.

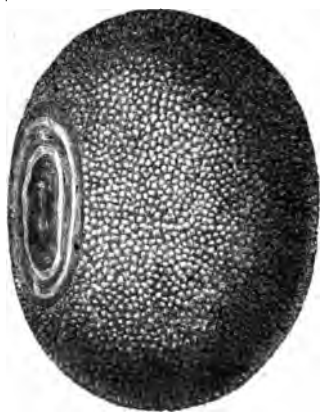
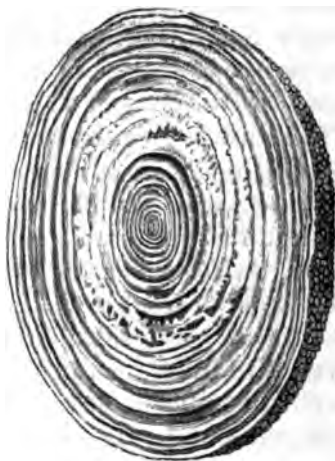


Fig. 39.



Uric Acid Calculi.

of other ingredients. Water has but little action upon it; it is perfectly dissolved by carbonate or hydrate of potassa without the evolution of ammonia; and disappears with effervescence in hot nitric acid, the solution affording, on evaporation to dryness,

a bright carmine-colored residue, which becomes purple, on the addition of ammonia. As the same reaction is afforded by the urates, the discrimination can only be made by the microscope. Before the blowpipe, it becomes black, emits a peculiar animal odor, and is gradually consumed, leaving a minute quantity of white alkaline ashes. Fig. 38 shows the oval shape and finely tuberculated surface of the calculus; fig. 39 the internal concentric layers.

A variety of the preceding, is the urate of ammonia calculus, which is principally observed in children, and is so extremely rare that several distinguished chemists have been induced to deny its existence. Of 1043 calculi, however, in the museums of the Royal College of Surgeons, Edinburgh, and Guy's Hospital, 21 are composed of this substance. It is generally of small size, with a smooth surface, of a slate or a clay color, and composed of concentric rings, which present a very fine earthy appearance when fractured. Much more soluble in water than the uric acid calculus, it gives out a strong ammoniacal smell when heated with caustic potassa, and deflagrates remarkably under the blowpipe. This variety of calculous concretion was first described by Fourcroy and Vauquelin in 1798.

The oxalate of lime calculus, which forms about the one-seventeenth of all calculi, is generally of a dark brown color, rough,

Fig. 40.



Fig. 41.



Oxalate of Lime Calculi.

spinous, or tuberculated on the surface, very hard, compact, and imperfectly laminated, seldom larger than a walnut, spherical, and always single. Under the blowpipe, it expands and effloresces into a white powder; it dissolves slowly in hydrochloric

and nitric acid, provided it be previously well broken up. In the alkalis, it is perfectly insoluble. This species of urinary concretion, called by many the mulberry calculus, from its resemblance to the fruit of that name, was first correctly analyzed, in 1797, by Dr. Wollaston, who proved it to consist essentially of oxalate of lime. Figs. 40 and 41 show the external and internal appearances of this concretion.

A variety of this species of calculus, represented in fig. 42, has been described by the term hemp-seed, from some resemblance which it bears in color and lustre to that substance. It is always of small size, remarkably smooth, and generally exists in considerable numbers, being rarely, if ever, found alone.

Fig. 42.

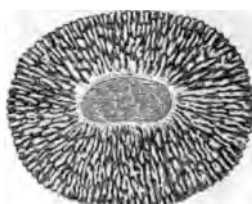
Hemp-seed
Calculus.

A very rare species of urinary concretion is the cystic oxide, so called by Wollaston, in 1810, from an erroneous supposition that it was peculiar to the bladder. It consists of a confused crystallized mass, of a whitish-yellow wax-like lustre, with a smooth or smoothly tubercular surface. The structure is compact, and the fracture exhibits a peculiar glistening lustre, like that of a body having a high refractive density. It exhales a strong characteristic odor under the blowpipe, and is very abundantly dissolved in acids and alkalis, with both of which it crystallizes. This species is commonly of an irregular, spherical shape, and seldom attains a large volume. The external and internal features of the cystic calculus are shown in figs. 43 and 44.

Fig. 43.



Fig. 44.



Cystic Oxide Calculi.

As an evidence of the rarity of this variety of concretion, it may be stated that, in the collection of calculi in the Hunterian Museum, embracing six hundred and forty-nine specimens, there are but three of the cystic oxide. The other London cabinets have hardly any examples; and M. Civiale, in his immense

practice, had, up to 1851, met with it only eight times. The Lexington collection, according to Dr. Peter, contains but two specimens. Dr. J. M. Warren, of Boston, a few years ago successfully removed a concretion of this kind by crushing.¹ I have not found the cystic oxide in any of my operations. Mr. Poland² states that there is a remarkable hereditary disposition to its formation, since out of 22 collected cases, 10 occurred in four families, and in 3 cases in brothers.

The xanthic, or uric, oxide calculus was first pointed out by Dr. Marcet, whose account of it is the best that is extant. It is extremely rare, having been met with only three times in man. Its texture is compact, hard, and laminated; its color is of a cinnamon brown, its surface smooth, and its volume small. It dissolves very readily in acids and alkalies, and is gradually consumed before the blowpipe, leaving a minute quantity of white ashes.

The phosphate of lime calculus, shown in fig. 45, and described by Wollaston in 1797, is of a pale brownish color, and of a loosely laminated structure, with a smooth, polished surface, like porcelain. The shape is mostly oval, and the size, although generally small, is sometimes very considerable. It whitens when exposed to the blowpipe, but does not fuse; and readily dissolves in hydrochloric acid, without effervescence. This calculus is extremely rare, as forming entire concretions, but frequently constitutes alternate layers with other matters. It is sometimes called the bone-earth calculus, and occasionally contains small quantities of carbonate of lime.

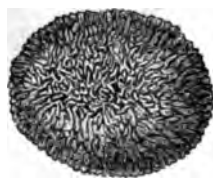
Fig. 45.



Phosphate Calculus.

The next species is the triple or ammoniaco-magnesian phosphate, so called from its being composed of the phosphate of ammonia and magnesia, and represented in fig. 46. This mixed calculus is of a white color, friable, crystallized on the surface, and looks a good deal like a mass of chalk; its texture being never laminated, it easily dissolves in dilute acids, but is insoluble in caustic potassa; before the blowpipe, it exhales an ammoniacal odor,

Fig. 46.

Ammoniaco-magnesian
Calculus.

¹ Dr. G. Blackman, New York Journ. Med. and Surgery, Jan. 1852, p. 109.

² Holmes's System of Surgery, vol. iv. p. 1025.

and at length melts into a vitreous substance. This species of concretion, also discovered by Wollaston in 1797, sometimes attains an immense size. In a case mentioned by Dr. Thompson, the circumference was fourteen inches, and the weight nearly two pounds.

The fusible calculus, or mixed phosphate, the nature of which was first determined by Wollaston, consists of a combination of the last two. It is of a white or gray color, very light and of low specific gravity, extremely brittle, leaves a soft dust on the fingers, and is easily separated into layers; when broken, it presents a ragged, uneven surface. It is insoluble in caustic potassa, but gives off ammonia; and, under the blowpipe, it is readily converted into a transparent, pearly-looking glass. This concretion forms about one-twelfth of all calculi, and sometimes attains a very large size. It is frequently met with as an incrustation of foreign bodies. Figs. 47 and 48 exhibit the outer appearance and internal structure of this concretion.

Fig. 47.



Fig. 48.



Fusible Calculi.

The carbonate of lime calculus, which was first described by Brugnatelli in 1819, is very uncommon. It is usually multiple, of a white or light brown color, and of small size. When of a light hue it is friable; but when of a dark color it is very dense

and compact. It effervesces freely when acted upon by acids previous to incineration.

The fibrinous calculus, like the preceding species, is also extremely rare, and appears to be composed principally of the fibrin of the blood, a property to which it owes its name, and by which it is characterized. Sir Benjamin Brodie¹ has described a concretion of this kind, which was about the size of a horse-bean, of an oval shape, and of a yellow transparent appearance, not unlike amber, but less hard. When dried, it shrunk to a small size, and became considerably shrivelled.

There is a singular concretion described by Heller, under the name of urostealith. It is exceedingly rare, and I do not know that any one else, except Dr. Moore, of Dublin, has noticed it. The specimen analyzed by the German chemist was passed by a man of tolerably good constitution, twenty-four years of age, whose chief complaint was pain in the region of the right kidney, with difficulty in micturition. The concretions were of a rounded form, soft, elastic, and from the volume of a hemp-seed to that of a hazelnut, most of them being as large as a pea. They become brittle on being dried, when they present the appearance of wax, of a greenish-yellow hue when viewed by transmitted light. When heated, they melt, and emit a peculiar, pungent odor, similiar to that of benzoin. Urostealith is readily dissolved by ether and by solutions of caustic potassa, but it is insoluble in boiling water, and nearly so in alcohol. It seems to be composed of a peculiar kind of fatty matter.

Finally, all calculi, whatever may be their composition and consistence, contain a certain amount of animal matter, which, being diffused through their interior, serves, like so much cement, to bind together their various constituents. It presents itself in different forms, the most common of which are albumen, mucus, and epithelium, but occasionally we meet with blood, pus, and other secretions, although rarely in any considerable quantity. The rapidity with which certain concretions are formed is often greatly influenced by the amount of animal matter present in the urine, or upon the surface of the calculus. Professor Scharling,² of Copenhagen, lays much stress upon this

¹ Lectures on the Urinary Organs, p. 214, second edition. London, 1835.

² On the Chemical Discrimination of Vesical Calculi, translated by Dr. S. E. Hoskins, p. 114. London, 1842.

subject, in relation to which he makes the following pertinent remarks: "The degree of rapidity," says he, "with which precipitation takes place depends on various causes. Among these may be enumerated the envelopment of the nucleus in albumen, blood, mucus, pus, or any other organic matter that chances to be present in sufficient quantity. These form a villous coating around the solid material, and their flocculi arrest, entangle, and ultimately determine the crystallization of the more insoluble ingredients of the urine. This explanation will go far to account for the animal matter contained in all calculi; the presence of which adds so greatly to the difficulty of distinguishing their constituents. It accounts also for the spongy interstices interposed between layers of a denser structure; and explains why certain calculi are full of small foramina.

"These organic substances, as they exist so constantly in calculi, may be regarded as the cement which binds calculous constituents together; and not only favors their increase, but in very many instances first lays the foundation for precipitation. If we attentively examine any of the fissured and perforated calculi so often met with, or those in which a central mass of crystals replaces the usual nucleus, we shall have evidence of the manner in which a clot of blood, or a flake of mucus or albumen, detains the solidifiable ingredients, the hydrate, as it were, and forms the elements of a nucleus, which consolidates, and in its turn constitutes the centre for future deposition."

Dr. E. B. Haskins,¹ of Clarksville, Tennessee, who, some years ago, investigated this subject, has ascertained that if a small quantity of calculous matter, imperfectly pulverized, and partially dissolved, be placed under a microscope, the particles thus treated will be found to be enveloped by a pellicle of transparent animal matter, which, when completely divested of salts, bears so great a resemblance to epithelial scales as to be easily mistaken for them. His observations, which were made with much care, confirm those of Scharling and other chemists in relation to the intimate penetration of all calculi by this substance, which thus forms, as it were, a kind of network for the reception and accommodation of the saline deposit. In addition to this matter, Dr. Haskins often detected, in the concretions which he examined,

¹ MS. letter to the author, July 29, 1854.

epithelial scales from the bladder and kidney, fibrinous casts from the uriniferous tubes, and a peculiar fibriniform matter without any definite structure. The central portion of the concretions always contained a large proportion of these substances, which were sometimes easily broken down, but, in general, they were tough and adherent. He thinks, moreover, that no calculus can form without the aid of matter foreign to the urine in a chemical sense, and that this matter is, as has been already seen, uniformly of an animal character.

SECT. III.—SITUATION.

Calculi generally lie loose within the cavity of the bladder, and are, consequently, liable to shift their position, not only with that of the viscus in which they are contained, but also with that of the body. A knowledge of this variation, in the position of these foreign substances, is of no little importance in regard to the operation of sounding. Their most common situation is, undoubtedly, the bas-fond of the bladder, from the fact that this is the most dependent portion of the reservoir. In old subjects, affected with enlargement of the prostate, the concretion generally lies just behind this body, in a sort of pouch, or cul-de-sac. When this is the case, and the calculus is of large size, it may often be easily felt by the finger in the rectum. When the bladder is perfectly sound, the concretion, especially when the patient is in the erect position, and the urine evacuated, rests against the neck of the organ, and sometimes even projects into the orifice of the urethra.

Cases occur in which the concretion is alternately loose and fixed. This may be owing to several circumstances, of which the most constant, perhaps, is the existence of an abnormal pouch. The foreign body may also be arrested in the folds of the mucous membrane, in the depression behind the prostate, or an inter-ureteral bar, in the substance of the prostate, in the orifice of the ureter, or in the mouth of the urethra.

Vesical calculi may become permanently adherent, attached, or fixed. This may take place in different ways, and under a variety of circumstances. The following may be mentioned as the most important: 1. An effusion of coagulating lymph. 2. The formation of an abnormal pouch; 3. The existence of a

papillary or polypoid tumor; 4. A bilobed state of the bladder; 5. The projection of the concretion into the ureter, or some other passage; 6. Its lodgment in the wall of the bladder.

1. The continual irritation caused by the presence of a calculus may lead to an effusion of coagulating lymph, the quantity of which, however, is rarely considerable. When this substance possesses a good deal of plastic power, it may become organized, notwithstanding the heterogeneous character of the urine with which it is incessantly in contact. Abnormal bands may thus be formed, by which the foreign body is tied to the inner surface of the bladder, and permanently retained in its place.¹ Or the quantity of lymph poured out may be so great as to surround and almost bury the concretion. In either case, its extraction may be attended with much difficulty.

2. Sometimes the calculi are contained in distinct cysts, sacs, or pouches, formed, in rare instances, by parietal abscesses which have opened internally, or, as more frequently happens, and as has been already seen, by a protrusion of the mucous membrane across the muscular fibres of the bladder. The volume of the incarcerated concretion is seldom large, nor is it often that more than one is contained in one pouch. Every sac, however, even if there be a considerable number, may be occupied by a stone.

One of the most beautiful and interesting specimens of sacculated calculi of the bladder, of which I have any knowledge, is represented in fig. 49, copied from a drawing, made for me, by Dr. A. Peticolas, formerly Demonstrator of Anatomy in the Medical College at Richmond, Virginia. The individual from whom it was removed had been a patient of Dr. T. Johnson, of that city, who had known him for several years, and attended him during his last illness. From the history of the case, as given by this gentleman, I learn that he was an old intemperate pauper, who at the time of his admission into the almshouse at Richmond, about ten days before he died, was very feeble, but free from pain and fever; his alvine and urinary discharges were regular, and he had never, so far as could be ascertained, passed any calculi either before or during his present illness. He was allowed whiskey and a generous diet, but took no medicine.

On examining the body, Dr. Johnson found a tablespoonful,

¹ Pennsylvania Hospital Reports, vol. ii., 1860, p. 49.

or more, of calculi lying loosely in the bas-fond of the bladder. The whole internal surface of the organ was studded with concretions, which were contained in distinct sacs, but from which most of them could be easily removed. Many small and some large ones, the latter as much as three-eighths of an inch in diameter, were completely encysted. The bladder was unusually large, the fundus mounting above the brim of the pelvis. The left kidney contained an abscess, which had not yet discharged its contents. The cephalic and thoracic organs were normal, as were also most of the abdominal.

Fig. 49.



Sacculated Calculi.

3. A stone may become fixed by a papillary growth of the bladder. This occurrence, although rare, has been noticed by different observers. The most common situation of this morbid growth is the trigone of the organ, where it may acquire a volume ranging between that of a marble and that of a pullet's egg. When the stone is unusually rough, knobby, or spinous,

an attachment may easily be formed between it and the tumor, by the processes which the latter sends into the openings, or around the projections of the former. The adhesion thus established may be very firm, especially if there be at the same time a considerable effusion of lymph.

4. A bilobed state of the bladder is sometimes observed, the organ consisting, as the name implies, of two compartments, of which the smaller one is usually above the other. A very instructive case of congenital bifid bladder, complicated by the presence of a calculus, has been reported by Dr. Scarenzio.¹ A calculus, developed in the lesser pouch, may not be able to pass into the larger, in consequence of the small size of the opening of communication, and may, therefore, be regarded as extravescicular.

5. A stone may become permanently impacted by projecting into the urethra, the ducts of the prostate, the orifices of the ejaculatory ducts, or the outlet of the ureter. The latter accident may happen in consequence of the imperfect descent of the concretion, or the calculus may be developed in the bladder, and be gradually prolonged into the tube. In a few rare instances, the stone has been known to project into both ureters as well as into the urethra.

6. The concretion is occasionally imbedded or encysted in the wall of the bladder. The sabulous matter, in this case, is probably deposited originally in a mucous follicle, where it gradually augments in quantity, and effects a secure lodgment by raising the mucous membrane over its surface, and contracting firm adhesions to the muscular fibres beneath. Several such calculi are represented in fig. 50. In general, the concretions are small, though they have been known occasionally to acquire a considerable bulk. In their number, they may vary from one to half a dozen or even more. An example has been recorded in which a calculus was lodged between the coats of the bladder.

7. Finally, the calculous matter, instead of being collected into a distinct concretion, is sometimes spread out in the form of a layer upon the *bas-fond* of the bladder. The crust thus formed is of variable extent, and ranges from the merest lamella to a mass several lines thick. In the latter case, it generally exhibits

¹ *Annali Universali di Medicina*, 1860, Dicbr., vol. 174, p. 531.

a concentric, stratiform arrangement. Its adhesion to the bladder is sometimes so firm as to render it difficult for the sur-

Fig. 50.



Encysted Calculi.

geon to break it. A layer of this kind, of considerable thickness, now and then forms around a villous or fibrous tumor of the bladder. When the calculous matter presents this peculiar arrangement, it grates under the instrument, and can be distinctly felt through the rectum. When struck with the sound, it emits a peculiar noise, not unlike that of a cracked pot. I have seen several specimens in which this lamelliform arrangement coexisted with separate calculi.

SECT. IV.—SYMPTOMS.

The symptoms of stone in the bladder may be conveniently divided into the rational and physical; or into those which are furnished by the suffering organ and the parts in its immediate vicinity, and those which are derived by the surgeon from a careful manual exploration. They may be divided, moreover, into local and general, as they affect the urinary apparatus, or the system at large.

The rational symptoms, which may be considered first, are not only numerous but considerably diversified in their character. They may be thus enumerated: Pain in making water, especially when the last drops are expelled, felt both in the bladder and the associated parts; a sense of weight and uneasiness in the pelvis, anus, and perineum; frequent micturition; an occasional interruption of the stream of urine; pain and itching in the head of the penis, with smarting or pricking sensations in the urethra, particularly at its orifice; enlargement of the penis and elonga-

tion of the prepuce; occasional priapism, with or without sexual desire; an increased secretion of mucus from the lining membrane of the bladder; a bloody state of the urine; incontinence of urine; prolapse of the rectum; sympathetic suffering; and, finally, the noise furnished by the calculi knocking against each other in the bladder.

The above symptoms usually come on gradually, and a considerable period often elapses before the patient is led to suspect the real nature of his condition. This is especially the case when the general health is good, and the bladder perfectly sound. Indeed, under such circumstances, the organ may, for a long time, take no cognizance of the presence of the foreign body. Gradually, however, marks of the disease are developed, and assume such a character as hardly to admit of being misinterpreted. Pain is felt at the neck of the bladder, reflected along the course of the urethra, and particularly severe during the emission of the last drops of water; the desire to urinate is more frequent than natural, and the effort to resist it more unavailing; there is a sense of weight or uneasiness in the perineum and anus; the stream of urine is often suddenly interrupted; more or less distress is experienced in the head of the penis; and, finally, every attempt at micturition is attended with straining and tenesmus. To these symptoms are gradually superadded most, if not all, of those above indicated. No regularity or uniformity, however, is witnessed, as a general rule, in the manner of their appearance. We may next proceed to examine the most characteristic of these symptoms in detail.

a. Pain.—Although sometimes absent, pain is usually one of the earliest and most characteristic symptoms of stone in the bladder. It is commonly of a sharp, darting, pricking, or burning nature, and is felt most keenly at the neck of the bladder and in the urethra, at the posterior portion of the head of the penis, during, but more particularly at the completion of, micturition, in consequence of the bladder contracting tightly on the calculus and impelling it against its sensitive neck. The reflected pain in the head of the penis, which is often a source of great suffering, is much more frequent and severe in the young and middle-aged than in the old, in whom it is sometimes very slight. It is seldom absent in any case. To mitigate this distress, the patient soon acquires the habit of forcibly grasping

the penis, and not only compressing it, but pulling it to obtund its sensibility. The habit finally becomes confirmed, and hence it is not unusual with this class of sufferers to have the hand constantly in the pocket and keep it employed, in consequence of which the penis is rendered not only unnaturally large, but the whole organ is increased in volume, and the prepuce more or less thickened and elongated. Frequent priapism, with or without sexual desire, also takes place, and is sometimes witnessed in the most tender infants.

The pain is generally aggravated by rough exercise; by pressure on the hypogastrium; by distention of the rectum; and even by a mere change of the position of the body. It is also considerably influenced by the form and volume of the concretion, the condition of the mucous membrane of the bladder, the temperament of the patient, and the state of the general health. A voluminous or rough stone causes more suffering than a small or smooth one. In exceptional instances, however, when the concretion is studded with spinous projections, the pain is very slight, probably because they admit of the more ready passage of the urine. An inflamed, ulcerated, or hypertrophied bladder is less patient of its contents than a comparatively healthy one. A nervous temperament, an irritable state of the system, a gouty or rheumatic diathesis, and intemperance of any kind, materially increase the local suffering.

An adherent or encysted calculus, or one contained in a pouch behind an interureteral bar or an enlarged prostate, rarely occasions much pain. Old men who never completely empty the bladder, and persons affected with atony or paralysis of this organ, suffer little from this disease. Finally, the pain may be reflected to the neighboring parts, as the testicles, scrotum, anus, thighs, groins, and even the kidneys. One or both testicles often become painful, and are commonly retracted when there is a severe fit of suffering.

β. Alterations in the Act of Micturition.—A very prominent, early, and constant symptom of this disease is a frequent desire to urinate. Instead of passing his water four or five times in the twenty-four hours, the patient is perhaps obliged to void it every hour and a half or two hours. In some instances, indeed, the calls to make water are almost incessant, and what increases the distress, in such cases, is the inability to resist them. This

symptom, which is liable to be greatly aggravated by certain states of the urinary apparatus, as, for example, an ulcerated condition of the lining membrane of the bladder, hypertrophy of the prostate gland, or stricture of the urethra, generally exists at a very early period of the disease, when the stone, perhaps, has not yet acquired the bulk of a cherry. It evidently depends upon a morbid sensibility of the neck of the bladder, caused by the frequent contact of the foreign body, and is always increased, or temporarily aggravated, during the day when the patient is walking about, by rough exercise, by the operation of sounding, the use of drastic purgatives, and various other causes; while it is decreased at night when the patient is in bed.

Another very valuable, because a very constant symptom of stone in the bladder, is a sudden interruption of the flow of urine. This is so common an occurrence that it may be regarded almost as pathognomonic. It is caused by the falling of the concretion against the neck of the bladder, thereby producing a partial or complete occlusion of the orifice of the urethra. It generally makes its appearance early in the disease, and is often one of the first symptoms that attracts attention. As it may occasionally be absent during urination, so it may sometimes come on repeatedly during the same act. The interruption thus caused, although generally momentary, may endure several minutes, or even much longer. A change of posture, gentle pressure on the hypogastric region, anus, or perineum, or rest for a few minutes on the back, usually suffice to dislodge the stone, and to free the orifice of the urethra. Occasionally, however, it happens that the calculus is firmly impacted in this canal, and then the stoppage amounts to a real retention, requiring the use of the catheter to push the intruder out of the way.

To avert pain by preventing the stone from interrupting the stream of urine, or by reinventing the flow when it has been arrested, a stooping posture is usually adopted during micturition; but not infrequently, the patient is obliged to place himself in a particular attitude. Thus, he sometimes crosses or separates his legs, inclines his body to one side, lies down, bends forwards, or supports himself upon his knees and elbows; sometimes he leans over and rests on his head. One of my patients, a lad, five years old, was constantly in the habit, when passing his water, of lying on his back and throwing his buttocks up in

the air. Professor Eve,¹ of Nashville, lithotomized a man, who, for two years previously to the operation, was obliged, whenever he wished to urinate, to assume the horizontal posture, and push up the bladder, which contained one hundred and seventeen calculi, with his fingers in the rectum.

Incontinence of urine, not constant, or even frequent, but occasional, is another symptom of this disease. It may be produced by several causes, of which the principal are, first, the presence of an unusually large stone, filling nearly the whole of the bladder; secondly, a loss of power of the sphincter muscle; and, thirdly, the partial obstruction of the orifice of the urethra, by the intromission of the foreign body. The urine, in all these cases, may dribble away incessantly, or it may be detained for some time, and then pass off involuntarily.

γ *Changes in the Urine.*—A very common attendant upon stone is an inordinate secretion of mucus or muco-pus. This, like some of the other symptoms already referred to, may be entirely absent; but it usually shows itself at a variable interval during the progress of the malady.

Hematuria is sometimes observed, particularly in the old and middle-aged, and is often directly traceable to the effects of rough exercise, when it becomes a symptom of some importance. The amount of blood poured out by the ruptured capillaries seldom amounts to more than a few drops, which are expelled with the last drops of urine. The sanguinolent appearance may last several days; but it generally promptly subsides under the influence of the recumbent position and demulcent drinks.

The constitutional effects of stone vary considerably in different cases, and under different circumstances. At the commencement of the disease, the general health, in the great majority of instances, is but little, if at all, impaired; this is particularly true of children, who, although suffering severe local distress, often retain their flesh and good looks in a remarkable degree, showing that their assimilative powers are in excellent condition. In some cases; however, the system feels the effects of the local mischief at an early period, and in the more advanced stages it rarely entirely escapes. Young men and old subjects usually suffer more than children. When the affection is simple, the

¹ Southern Med. and Surg. Journal for 1849.

constitutional symptoms are generally slight, compared with what they often are when it is complicated with serious lesion of the urinary organs, especially of the bladder and the kidneys. Under such circumstances, the general health is commonly severely deranged; the patient is thin and wan; the countenance is expressive of deep distress; the pulse is small, frequent, and irritable; the skin is dry and husky, and exhales a peculiar urinous odor; the surface is remarkably susceptible to external impressions; the sleep is disturbed at night; the appetite is impaired; the stomach is harassed with sour eructations; the bowels are irregular; the urinary secretion is vitiated; and the extremities are constantly cold. When the disease exists in its worst form, the symptoms here enumerated become greatly aggravated; and the patient is gradually worn out by hectic irritation, accompanied by night-sweats and colliquative diarrhœa. The duration of the disease, from its commencement to its final termination in death, varies in different cases, and under different circumstances, from eighteen months to ten, fifteen, twenty, and even thirty years.

The symptoms of this disease, after having, perhaps, existed for a long time in an aggravated form, are occasionally completely arrested, or so much mitigated as to induce the patient to believe that he is well. The pain diminishes, micturition is rendered more easy, and the general health decidedly improves. In this way the case progresses for weeks, perhaps, indeed, for months, when all of a sudden, in consequence, it may be, of exposure to cold, or some irregularity of the diet, the disease returns with its wonted violence; the urine assumes a turbid, purulent, or lactescent aspect; fever sets in; the tongue is covered with a whitish fur; the digestive function is disturbed; the face becomes pale and wan; rapid emaciation takes place; and death at length relieves the poor patient of all his troubles. In other cases, the symptoms recur in a very mild form, and the patient lives for years in comparative comfort. The causes of these changes are seldom appreciable.

Finally, it should not be forgotten, that in addition to the reflex pains experienced in the associated parts of the urinary organs, suffering is sometimes perceived at parts very remote from the seat of the disease. Dr. Marshall Hall¹ had a case in

¹ Diseases of the Nervous System, London, 1841, p. 339.

which a stone in the bladder caused spasmodic stricture of the sphincter muscle of the anus. The contraction was so great as scarcely to admit of the introduction of the finger. The moment the calculus was removed, the reflected irritation ceased. Pains, with numbness and tingling, have also been experienced in the heel, knee, or foot. An English nobleman suffered from pain in the left arm, for which his professional attendants were for a long time unable to account. Upon introducing a sound, the true nature of the case was detected, the stone was removed, and the trouble ceased.¹ A still more remarkable instance of sympathetic disturbance in consequence of the irritation of the vesical nerves by a calculus, is one of epilepsy, which came under the observation of Dr. John Duncan, of Scotland. A boy, five years of age, had been suffering all his life from incontinence, pain in the bladder, and other symptoms of stone. For upwards of two years he had frequent attacks of epilepsy, which continued with more or less severity, until about a fortnight after he was lithotomized, when they permanently disappeared.

SECT. V.—PHYSICAL SIGNS, SOUNDING, DIAGNOSIS.

When the symptoms above described are all present, or even when several of them are absent, there is a strong probability that the patient is laboring under stone of the bladder, and this probability is converted into certainty, when the surgeon is able to feel and hear the foreign body. Nevertheless, as will be subsequently seen, cases occasionally occur, in which, notwithstanding the existence of both the rational and physical signs, no concretion is to be discovered. On the other hand, a stone may apparently have been detected, and yet when the patient comes to be cut, no stone is found. Instances of both these occurrences have been repeatedly met with, and that, too, in the hands of the most experienced and accomplished lithotomists. To remove, therefore, all doubt upon the subject, no matter how clearly marked may be the rational symptoms, it is always necessary, as a preliminary step, to resort to sounding. This consists in introducing into the bladder an instrument, fig. 51, shaped

¹ Hunter's Works, edited by Palmer, vol. i. p. 321.

somewhat like a catheter, and either solid or hollow, with which the cavity of the organ is explored in every possible direction, and in the most patient, thorough manner. The instrument itself is called a sound.

Sounds vary in their construction, in their size, and in the materials of which they are composed. The best are solid, made of steel, and plated with nickel, with varying degrees of curvature. For an adult, the length, from one extremity to the other, should be about twelve inches, of which two inches and a half should be allowed for the handle. Children, of course,

Fig. 51.



Sound.

Fig. 52.



Hollow Sound.

require a shorter instrument. Generally speaking, a shaft of moderate diameter is preferable to one of large size, as it does not distend the parietes of the urethra, and is consequently much more easily moved about in the bladder. The vesical extremity, or beak, should be about an inch long, be more abruptly curved than that of an ordinary catheter, and be several sizes larger than the shaft. With an instrument constructed on these principles, every portion of the bladder may be explored with facility.

Some lithotomists prefer the ordinary silver catheter to the instrument now described, on the ground that it is more convenient when it is necessary to inject the bladder or draw off the urine. This is undoubtedly an advantage, which is not compensated, however, by the disadvantages of the more obscure noise and sensation, which such an instrument yields from its contact with the calculus. An excellent substitute for the catheter is the hollow sound, represented in fig.

52, which, by permitting the gradual escape of the urine, greatly facilitates the detection of the concretion.

Previously to sounding, the bowels should always be well cleared out with castor oil, or a purgative enema, in order that

there may be no obstruction in the rectum to impede the movements of the instrument, or interfere with the free play of the finger, should its introduction into the gut become necessary.

A patient is never sounded when the bladder is empty. In this condition the organ is apt to contract upon its contents, and may so prevent the instrument from moving about with that freedom which is so necessary for detecting the stone. The quantity of water which the bladder should contain must vary according to circumstances, as the capacity of the organ and the size of the concretion; but, in general, it need not exceed three or four ounces. If the urine is too abundant, there is danger that the stone, especially if it be small, will be lost in the fluid, and thus elude the sound. I have repeatedly met with cases where the bladder was so irritable as to be hardly able to retain any urine, even for a few minutes. Under such circumstances, and also where the patient has urinated inadvertently, the requisite distention should be produced by the injection of tepid water through the hollow sound.

During the operation, the patient should lie upon his back, near the edge of the bed, with his head and shoulders somewhat elevated, and the lower extremities slightly flexed and separated, to relax the abdominal muscles. The surgeon takes his position at the left side of the patient, warms and oils the instrument, and introduces it in the same manner, and with the same precautions as when he introduces the lithotrite.

Frequently the sound encounters the stone the moment it enters the neck of the bladder; but should this not happen, it must be passed farther in, and moved about in different directions until the object is accomplished. To explore the lateral parts of the bladder, the instrument must be rotated upon its axis, first on one side, and then on the other. The bas-fond of the organ is best examined by reversing the beak of the sound, and elevating the handle. The anterior or pubic surface of the bladder can be reached only by an instrument with a very long curve, or by depressing the ordinary sound between the patient's thighs, while the bladder is forced downwards by the left hand over the hypogastrium. Very frequently the stone cannot be felt, in consequence of its lying in a pouch just behind the prostate gland. When this is the case, the index finger of the

left hand, properly oiled, is introduced into the rectum, and the foreign body pushed forward from its lurking-place against the reversed sound. Sometimes it is necessary to change the position of the patient, making him lie on his side, sit or stand, bend forward, or raise his buttocks. Dr. Physick occasionally placed his patients nearly on their head, so as to render the fundus of the bladder the most dependent portion of the viscus. Indeed, every variety of expediency is sometimes required to enable us to accomplish the object of this preliminary operation. Children often greatly embarrass us by their cries, as well as their struggles; but these sources of annoyance may be effectually counteracted by the use of chloroform, which I am in the habit of employing in nearly all cases of the kind, for the purpose of preventing pain, calming the patient's mind, and quieting the bladder.

The noise and sensation communicated by sounding are peculiar. The noise is a sort of click, or clear metallic resonance, which is caused by the contact of the stone and the instrument, and which no other bodies in the bladder can produce. It is, therefore, in the highest degree valuable as a diagnostic sign. It may often be perceived at a distance of several yards from the patient, and is generally more distinct and clear when the stone is composed of uric acid or oxalate of lime, than when it is of a phosphatic nature, when the sound is faint and dull. The click may be rendered more audible by attaching the sounding-board of Mr. L'Estrange to the handle of the instrument. The sensation communicated to the hand is likewise liable to considerable diversity. When the calculus is diminutive, it is generally proportionately faint, and indicative of a want of resistance on the part of the body touched; if, on the other hand, the concretion is large or of medium bulk, the instrument, in encountering it, receives a sort of shock which is rapidly and forcibly communicated to the hand, and is so characteristic that it can never, when once perceived, be mistaken. A grating, rubbing, or friction sensation is sometimes distinguished; but this is rather indicative of a fasciculated state of the bladder, of the existence of a morbid growth, or an incruusted condition of the mucous membrane, than of the presence of a calculus.

Sounding enables the surgeon not only to detect the presence of a calculus in the bladder, but it frequently furnishes important

data in regard to its bulk, situation, and consistence, and as to whether it is single or multiple, rough or smooth, loose or attached.

It is usually not very difficult to form a tolerably correct idea of the volume of a stone. If it is easily pushed about by the instrument, and lost, as it were, in the midst of the water, it may be inferred that it is small; on the contrary, it may be concluded that it is quite bulky, if it maintains its position under the action of the sound, or if it can be touched simultaneously at a number of points, or, what is the same thing, if it presents a large surface. A large calculus is always easily felt by the finger in the rectum; while a small one is either not perceived at all, or only in a very imperfect manner. Where greater accuracy in regard to the volume of the calculus is desired than can be obtained by the more common methods of exploration, a particular instrument, marked by the divisions of the metre, may be employed. For this purpose, a common lithotrite might be used, or the contrivance of Mr. L'Estrange, constructed upon the same principle. A similar instrument has been invented by Dr. Fleming,¹ of Dublin, for measuring concretions in the bladder of children.

In trying to ascertain the situation of a stone in the bladder, important aid may be derived from the introduction of the finger into the rectum, or vagina. Indeed, this can, in many instances, be done in no other way. My invariable plan is, when I sound a patient, to resort to this expedient. In old subjects, in which the calculus frequently lodges in a pouch just behind the prostate gland, its presence can hardly be detected without it. In children, too, it is a most valuable auxiliary. The pelvis, at this age, is usually so short and narrow that nothing is more easy than to trace the whole outline of the inferior portion of the bladder, enabling us frequently at once to determine not only the situation of the concretion, but also whether it is loose or fixed, small or large, single or multiple. When there is reason to suspect that the stone is situated in the fundus of the bladder, or just behind the pubes, it might, especially if it be large, and the bowels are perfectly empty, be possible to detect it with the hand, applied to the lower part of the hypogastric region.

¹ Dublin Quarterly Journal of Medical Science, vol. xviii. p. 257.

The noise furnished by the instrument affords sometimes a pretty accurate knowledge of the consistence, structure, and chemical qualities of the foreign body. The uric and oxalic calculi, as previously stated, emit a clear sound, clink, or click ; the phosphatic, a flat sound ; and the ammoniaco-magnesian, a sound intermediate between the two.

By carrying the instrument about in different parts of the bladder, we may ascertain whether there is but one stone or whether there are several, and even form a tolerably correct idea of their actual number. When several coexist they are usually small, and the sound, upon striking them, produces a sort of clashing sensation, attended with a rattling noise.

The stone may be supposed to be smooth, when the sound, brought in contact with its surface, glides easily over it, without being impeded in its progress. If, on the contrary, it is rough, spinous, or tuberculated, the point of the sound is liable to become arrested, and may thus impart a grating sensation to the fingers. It has been already stated that the multiple calculi are nearly always smooth, and the single more or less rough.

We judge that the stone lies loosely within the bladder, when it changes from time to time its position, or migrates, as it were, from one part of the organ to another. An encysted or adherent stone is always found in the same situation, due allowance being made for the alterations of form, which the bladder undergoes from the presence or absence of the urine.

Patients are often brought to the surgeon from a distance to be lithotomized. When this is the case, they should not be sounded until they have recovered from their fatigue. Nor should the operation be performed during or immediately after a "fit of the stone." Indeed, simple as the operation is, it should never be resorted to without due consideration. If it is important, as it is universally acknowledged to be, to prepare the system for the operation of lithotomy, it is hardly less so, in my judgment, to prepare it for that of sounding. From neglect of this precaution, patients are often subjected to much suffering, and even to great risk. Indeed, there is reason to believe that life has been repeatedly sacrificed in this way. Bad consequences occasionally follow, even when the utmost care is taken. I have myself witnessed very serious effects from this kind of indiscretion, which has been followed by severe cystitis. Sir

James Paget has known death to ensue from simply sounding for stone in six instances; and Fletcher, Crosse, Sanson, Civiale, Horner, and other surgeons, allude to similar cases.

The sounding should always be conducted with the utmost gentleness, and should never be continued beyond a few minutes at a time. A protracted operation of this kind is generally productive of mischief, and cannot be too pointedly condemned. Should severe pain ensue, it must be allayed by a full anodyne; and any inflammatory symptoms which may arise are to be combated by the usual remedies. In all cases, the patient should be directed to make free use of demulcent drinks.

Although sounding is the only certain method of detecting a stone in the bladder, it is occasionally liable to error. Numerous cases are upon record where a foreign body was supposed to be present, and where the poor patients were subjected to all the pains and perils of lithotomy, and yet no calculus was found, either at the time of the operation or after death. Surgeons of the most consummate skill and the most extensive experience have fallen into this error. Cheselden, the most celebrated lithotomist of his age and country, cut three patients without finding any stone. Blanc, Dupuytren, Roux, Crosse, Tyrrell, Cotta, Vacca, Aason, Medoro, Borsiori, Ucelli, and Paget, of Leicester, all operated, expecting to find a stone, where there proved to be none. Mr. Crosse states that he has notes of not less than eight cases in which the operation was needlessly performed, and to several of which he was an eye-witness. The late Mr. Samuel Cooper, of London, was acquainted with the particulars of at least seven such cases, at two of which he was present. Velpeau says he has a knowledge of four instances, where the patients were subjected to the operation without there being any calculi in the bladder, and I myself am cognizant of at least half a dozen cases in which this mistake was committed. It is worthy of remark that a number of the patients in whom no stone was found were promptly and entirely relieved of the symptoms which had been attributed to its presence. On the other hand, it is equally certain that some of them perished from the effects of the operation, while others who survived it received no benefit from it.

The circumstances which may lead to the commission of the error above mentioned differ very much in their character, and

are dependent for their origin either upon the bladder itself, or upon the surrounding parts.

Among the more prominent causes of error referable to the bladder, are an ulcerated¹ or indurated and contracted state of the viscus;² the presence of an osseous cyst;³ a papillary⁴ or polypoid fibroma;⁵ and a deposit of tubercular matter.⁶

In the second place, the surgeon may be misled by certain affections which involve the parts in the immediate vicinity of the bladder, as enlargement of the prostate gland;⁷ hardened and impacted feces;⁸ malpositions of the uterus;⁹ exostosis of the pelvis; protrusion of the head of the thigh bone into the bladder;¹⁰ and an unusually projecting sacrum, in a very narrow pelvis.¹¹

It is well known that there may be a stone in the bladder, and yet the surgeon be unable to detect it by sounding, aided, perhaps, by all the auxiliary means at his command. This failure has frequently occurred, even where the concretion has been uncommonly large, and where the operation has been repeatedly performed with the greatest care and skill, and varied in every possible manner. Want of success has sometimes attended, even where the calculi were multiple. Again, it has happened that a stone has been promptly detected in a first sounding, and perhaps not at all, or only after much trouble, in a subsequent one. Or the reverse of this may occur, that is, the concretion may elude the instrument in a first and second sounding, but be always readily detected afterwards. It is with sounding as with everything else. To perform it well requires great tact in the use of instruments, a perfect knowledge of the

¹ Occurred to Mr. Tyrrell. Dublin Quarterly, vol. xiv., 1852, p. 462.

² Occurred to Cheselden in three cases—Benjamin Bell's System of Surgery, Edin. 1784, vol. ii. p. 40; and to Blanc—Desault's Parisian Chirurgical Journal, translated by Gosling, vol. ii. p. 125.

³ Occurred to Mr. Middleton. Case referred to at page 135.

⁴ Case of an old man who was under my care in Kentucky. I declined to operate, and he was cut by another surgeon.

⁵ Case recorded by Mr. Crosse. See Case I. of table on page 153.

⁶ Occurred to Dupuytren. Leçons Orales, t. ii. p. 334.

⁷ Case mentioned by Ripault. Monthly Journ. Med. Science, 1842, p. 871.

⁸ Case mentioned by Rutti. Traité des Voies Urinaires, p. 25.

⁹ Recorded by Lassus—Méd. Opér. t. i. p. 315; and two cases by Levret, Jour. de Méd. et de Chir., Janvier, 1783, p. 35.

¹⁰ Recorded by Uytterhoeven. Archives de la Méd. Belge, t. viii. 1842, p. 44.

¹¹ Mentioned by Crosse. Essay on Urinary Calculus, p. 50.

anatomy of the urinary apparatus, and a degree of experience which multiplied observations alone can supply. But the want of success, in this operation, is not confined exclusively to the young, the ignorant, or the unskilful. Men of the most consummate dexterity have occasionally failed in detecting a stone, when a stone really existed.

Numerous circumstances may interfere with, or entirely prevent, the detection of a vesical calculus; and hence it may become necessary to examine a patient not merely once, but perhaps many times, before we are justified in giving a definite and final opinion respecting the nature of the case. The sub-joined arrangement comprises the most important of the causes, which may prevent the detection of calculi.

I. Obstacles dependent upon the calculus itself.

a. The stone may be unusually small, in which case it will not only be more difficult to detect it, but, when found, it will be more liable to glide away from the instrument, and so elude its contact. The sound emitted by it will also be proportionately faint and indistinct.

b. The concretion may not only be diminutive, but it may be coated with a layer of lymph, coagulated blood, or inspissated mucus, so that the instrument shall glide over it without receiving from it the customary impression.

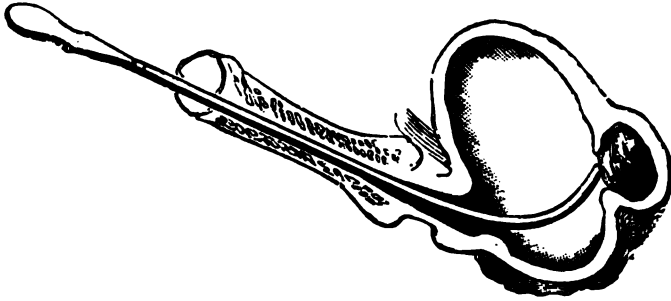
γ. A very bulky stone, without exhibiting anything peculiar in other respects, has sometimes eluded the sound. The principal reason of this is the situation of the foreign body in a dependent or unusual part of the bladder, the size and form of the instrument, or the manner of conducting the exploration.

II. Obstacles connected with the bladder.

a. The calculus may be sacculated, or contained in a particular pouch, formed by the protrusion of the mucous membrane across the muscular fibres of the bladder, of which a good illustration is afforded in fig. 53. In this case, the foreign body lies virtually on the outside of the urinary reservoir, within the pelvic cavity, and may be so protected by the thickened parietes of the organ as to render its detection utterly impracticable by the most careful sounding. In an instance mentioned by Mr. Nourse, in the forty-third volume of the London Philosophical Transactions, the calculi, nine in number, and contained in six separate cysts, were detected in the first sounding, but never afterwards.

Ellerus relates a case in which a stone existed between the coats of the bladder.¹

Fig. 53.



Sounding for Encysted Stone.

β. In many cases, especially in aged subjects, a pouch, hollow, or cul-de-sac, exists in the bas-fond of the bladder, immediately behind the prostate gland, in which the calculus may lie secure from the sound, as represented in fig. 54, unless its beak be reversed.

Fig. 54.



Sounding for Stone behind the Prostate.

γ. The stone sometimes lodges in front of the bladder, just behind the pubes, either in a cyst, or attached by a band of lymph, or adherent to the mucous membrane, as in fig. 55. When this happens, it will be difficult, if not impossible, to reach it, unless the instrument is unusually long, its curve uncommonly great, and its handle inordinately depressed between the patient's thighs.

¹ Morgagni, Seat and Causes of Diseases, vol. ii. p. 354.

8. The urinary bladder may be bilobed, or divided by a kind of diaphragm into two compartments, the upper of which may contain a calculus, which no sound, however shaped or managed, may be able to reach or detect.

Fig. 55.



Sounding for Stone above the Pubes.

9. When the bladder escapes into the groin, as it does in certain forms of hernia, it may contain a stone which no sounding, however skilfully conducted, can discover. In a case of this description, recorded by T. D. Sala, the patient had all the symptoms of stone, but no stone could be felt during life. After death, it was found in the bladder, which had passed into the groin. Pott¹ gives a similar instance. The patient was a boy thirteen years of age, and the stone was removed by incision from the groin, where it had been confined in a firm, strong, white cyst, connected with the bladder. Urine passed by the wound for several weeks, but the cure was completed in a month. In the female, the bladder sometimes passes into one of the labia. Hartmann² met with a case of this kind in which the protruded part contained a stone weighing three ounces.

10. A stone, especially when small, may be temporarily lost in the folds of the bladder, and so elude the sound. When this organ is fasciculated, the foreign body might be arrested permanently in one of the depressions or cavities which are so frequently met with under such circumstances. A stone so imbedded would be likely to remain small, and burying itself, as it were, beneath the hypertrophied muscular fibres of the

¹ *Chirurgical Works*, vol. ii. p. 397. Phila. 1819.

² *Eph. Nat. Cur. Ann.* v. obs. 71.

bladder, would impart through the sound a very faint and imperfect sensation to the hand.

7. The bladder may contain too much or too little water. In the former case, unless the stone is of considerable size, it will be difficult to touch it, or, if struck, to obtain the characteristic feel and click. It will fly before the instrument, and be lost in the midst of the fluid. If, on the other hand, the quantity of urine is very small, the bladder, by contracting forcibly upon the concretion, may hold it firmly in its grasp, and so prevent it from being satisfactorily felt and heard. In such a case, moreover, the stone, especially if it be small, may be concealed in the folds of the mucous membrane.

8. Finally, the surgeon may fail in his attempt to feel the stone, in consequence of an immense accumulation of blood or inspissated mucus in the bladder. From the same causes, especially the latter, the pain arising from the presence of the concretion may become materially mitigated, particularly if the adherent mucus is very thick, or intermingled with coagulating lymph.

III. Obstacles arising from the neighboring organs, as the ureter, prostate gland, and urethra.

a. The stone may elude detection in consequence of an enormous dilatation of the ureter. The sound may move about in the abnormal pouch with the same freedom nearly as in the bladder, in which the calculus is contained, but which the instrument fails to enter. Such a contingency, although very infrequent, has been several times encountered in practice.

β. The prostate gland, excavated by disease, as an ulcer or an abscess, may occasionally conceal a small calculus so as to prevent it from being touched by the sound, or felt by the finger in the rectum. When there is reason to suspect such a condition, the proper mode of proceeding would be to use a sound with the slightest possible curve, and to push the calculus out of its bed by inserting the finger into the bowel.

The prostate gland is sometimes converted into an immense pouch, in which the end of the sound may be arrested, without detecting any stone, instead of passing into the bladder, where the foreign body is actually situated. Muller¹ mentions the

¹ Diss. Raram de Calc. Vesic. Observat. Continens, p. 17.

case of a boy, eight years of age, in whom such a lesion led to this mistake. He was sounded twice without any stone being discovered. The third time, however, it was detected, and the operation was accordingly performed; a large quantity of pus escaped, but no calculus was found. The patient died, and on dissection it was perceived that the bladder had been converted into a fleshy mass, contracted tightly round a concretion of the size of a small lemon. The prostate was partly destroyed by suppuration, and presented an enormous cavity into which the instrument had wandered during sounding, and which had been mistaken for the bladder. A similar case is mentioned by Civiale.¹

γ. Another source of error is the introduction of the sound into an abnormal pouch of the urethra. This affection, although infrequent, occasionally exists, and may lead to deception. Pelletan² saw two cases which were mistaken in this manner; in one the stone was about the size of a pullet's egg; and in the other, a child seven years of age, it nearly filled the bladder.

The symptoms of stone may be simulated by reflex irritation, seated either in the urinary organs themselves, or in the neighboring viscera. Among the more prominent causes of sympathetic irritation may be mentioned irritability, neuralgia, spasm, and simple or tubercular ulceration of the bladder, inflammation or calculus of the kidney or ureter, chronic hypertrophy of the prostate gland, stricture of the urethra, contracted meatus, vascular growths of the urethra, adherent prepuce, and phimosis. The latter occurrence is most common in boys. Incredible as it would seem, vesical calculus may be simulated by aneurism of the abdominal aorta, as in the interesting case related by Mr. Fenwick,³ of England.

The presence of a stone in the bladder generally gives rise to well-marked symptoms, which, if they are not characteristic, always strongly point to the affected organ, and ultimately lead to the detection of the foreign body by the sound. There are, however, instances in which a calculus may exist in the bladder for a long time, and even acquire a large bulk, without occasion-

¹ *Traité de l'Affectio Calculeuse*, p. 485. Paris, 1838.

² *Ségalas, Essai sur la Gravelle et la Pierre*, p. 155, sec. edit. Paris, 1839.

³ *Amer. Journ. Med. Sciences*, vol. xi., N. S., p. 492.

ing any local suffering indicative of its formation, such as spasmodic pain, frequent micturition, and sudden interruption of the stream of urine.¹ To cases of this kind the term latent may very properly be applied.

Latent stone is most common in advanced life, though it occasionally occurs at an earlier period. I am not aware that it has ever been noticed in children or young adults.

It is not easy to account for the absence of suffering in such cases. Various circumstances have been adduced for the purpose of explaining it, but very few of them are, it must be confessed, either philosophical or satisfactory. The generally received opinion is that it is owing to the smoothness and immobility of the morbid product, and to the want of sensibility of the mucous membrane. This view appears to be confirmed by the interesting cases mentioned by Frère Côme,² and Van Helmont. In the former, that of a watchmaker, forty-five years old, the patient never experienced any suffering in the bladder, except that he could not retain his water long. This continued for many years, when one day, in lifting a heavy clock, he was suddenly seized with a severe pain in the hypogastric region. This becoming gradually more and more insupportable, he was induced to enter one of the public hospitals of Paris, where the sound detected a large calculus, which was removed by the high operation, and which weighed twenty-four ounces. In the case related by Van Helmont, the patient, a priest, without any previous suffering, suddenly experienced symptoms of stone from lifting a book. The concretion was easily detected by the sound, and was afterwards removed by an operation. In each of these instances the calculus evidently changed its situation, in consequence of the exertion made by the patient in lifting a heavy weight; it might have been encysted, inclosed in a pouch, or attached by a band of false membrane, which gave way at the moment, and thus led to the usual symptoms, as well as to the necessity for an

¹ Henricus ab Heer (*Observationes Medicæ rariores*, ob. 26, 1685) mentions an instance in which the stone attained the magnitude of a goose's egg, without producing any symptoms. Mr. Howship (*A Practical Treatise on the Urinary Organs*, p. 125, London, 1823) states that he examined the body of a man whose bladder contained at least a dozen calculi, several of them as large as a chestnut, and yet he never had any symptoms of the disease.

² Deschamps, *Traité de la Taille*, t. i. p. 166.

operation. When the concretion lies loose in the bladder, the absence of symptoms may be accounted for by supposing that there is great and permanent insensibility of the mucous membrane of the bladder, such as might be supposed to exist in partial or complete paralysis of that organ. A case, recorded by Deschamps,¹ appears to have been of this description. The patient, an octogenarian tailor, had frequent retention of urine from palsy of the bladder; and, although a stone was distinctly felt by the sound, he never experienced any of the ordinary phenomena of the malady.

A case, in which there appears to have been an absence of local symptoms, although the bladder contained a large number of loose, as well as encysted calculi, is mentioned in a preceding section. It occurred in an old man, a patient of Dr. Johnson, of Richmond, Virginia, and is one of the most remarkable examples of vesical calculi on record.

We are not sufficiently familiar with the latent form of vesical calculus to enable us to judge what influence affections of other parts of the body may have in disguising it, or preventing the development of local symptoms. Further and more faithfully conducted observations than any that have yet been made can alone settle this question. For the present, it is enough to know that such a form of disease occasionally exists.

One great object in sounding is to determine, if possible, the existence or non-existence of stone. Another object, hardly less important, especially in reference to the ultimate dislodgment of the foreign body by an operation, is to ascertain the condition of the urinary apparatus. This can frequently be accomplished in no other manner. By moving the instrument about the bladder in different directions, touching first one part and then another, and duly weighing the impressions which it conveys to the hand, we become apprised of the capacity of the organ, and the amount of its sensibility or tolerance. Moreover, we can generally determine, with considerable accuracy, by such a mode of exploration, whether the inner surface of the bladder is smooth or rough, ulcerated or fasciculated, incrustated with lymph or sabulous matter, or the seat of morbid growths. The passage of the sound along the urethra enables us to judge whether this

¹ Op. cit., t. i. p. 165.

canal is healthy or diseased, contracted, changed in its direction, or obstructed by the presence of a foreign body or an adventitious formation. The condition of the prostate gland is best determined by inserting the finger into the rectum, at the same time that the sound is pressed against it from before backwards. We can thus often pretty accurately measure its dimensions, its degree of consistence, and the amount of obstruction which it produces at the neck of the bladder, both as it respects the emission of the urine and the passage of instruments. The anus and rectum should also be carefully examined, either by the finger alone, or by means of the speculum, with a view to ascertain whether they are healthy or diseased. The light which we derive from these explorations frequently enables us to form a tolerably correct idea of the propriety of surgical interference, or the probable issue of the case.

SECT. VI.—PATHOLOGICAL EFFECTS.

Although the formation of vesical calculus is the immediate result of a morbid condition of the urinary secretion, the bladder and its associated organs are generally diseased, to a greater or less extent, in the progress of the affection. The primary impression is probably always made upon the viscus in which the concretion is confined; but the irritation which its protracted presence there induces is gradually reflected upon the other portions of the apparatus, awakening in them, in the first instance, important sympathetic actions, and ultimately serious structural lesions. The secondary effects thus set up are sometimes sufficient to mask the original disease, and often lay the foundation for the patient's destruction, long before it would otherwise take place.

One of the first, and indeed almost necessary effects, to which the foreign body gives rise, is inflammation of the mucous coat of the bladder, which is most severe at the neck and bas-fond, and is followed not infrequently by thickening, increased vascularity, and the development of papillæ or ulceration. The irritation, at first limited to the mucous membrane, gradually extends to the other tunics which become hypertrophied, and in the advanced stages of the disease, are often accompanied by a fasciculated and sacculated state of the bladder. A copious

secretion of thick, tough mucus, usually attends these morbid changes, and, not infrequently, even a considerable discharge of pus, lymph, or blood, or of all these substances together.

A diminution in the size of the bladder is not uncommon, even in young subjects, but is much more frequent in old persons who have labored for many years under the continued irritation of a calculus. It is almost always a concomitant of the hypertrophied and fasciculated condition, and may go on until the organ is unable to contain more than an ounce or two of urine. The opposite of this state, or an increase of size, is occasionally met with. It occurs chiefly in very old subjects, and in persons who have long suffered under paralysis of the bladder. It varies in extent from the slightest increase to double and even triple the natural volume.

One of the most distressing accidents which take place, during the progress of this disease, is perforation of the bladder, followed by a partial or complete escape of the stone, and the formation of a fistule. When it is accompanied by extravasation of urine into the surrounding connective tissue, it may terminate fatally in a few days, or lead to violent inflammation and suppuration, inducing death at a more distant period. The part of the bladder most prone to perforation is the *bas-fond*; but the opening may take place at any point. Thus, a calculus has been known to escape at the groin, above the pubes, and at the perineum. In the female, it may be discharged through the vagina, and thus occasion a vesico-vaginal fistule.

The urethra rarely suffers, except in its prostatic portion, which may be unnaturally red, inflamed, hypertrophied, or attenuated. When the calculus is small, and is often forcibly impelled into the canal by the stream of urine, it may become greatly dilated, and even transformed into a pouch.

A calculus seldom remains long in the bladder without exciting disease in the prostate gland. This frequently happens, even in very young subjects, and while the malady is still in its incipency; but is much more common in the aged and in the more advanced periods. The organ, from the continued irritation which it suffers, receives an unnatural amount of blood, in consequence of which it gradually increases in volume and density, and thereby immensely aggravates the primary affection. It sometimes enlarges in every direction, impeding the flow of

urine, augmenting the pain and spasm of the bladder, and even producing serious pressure upon the rectum. Ulceration, abscess, and sloughing may follow from the constant and excessive irritation. In some instances, the prostate is converted into a cavity, nearly equal to that of the contracted bladder itself, and capable of lodging a calculus of considerable size. On the other hand, the gland may be greatly diminished in volume.

The ureters are frequently inflamed and thickened, and sometimes even ulcerated. One or both are occasionally enormously enlarged, or one is enlarged and the other contracted. These changes are most common in old subjects, and in protracted cases.

The kidneys rarely entirely escape in this disease. There are few cases, of long standing, in which they are not inflamed, increased in size, or altered in structure. In the worst forms of the malady, it is not unusual to see one of them converted into a large pouch filled with purulent matter, or turbid urine. In rare cases Bright's disease is present.

Abscesses and fistules occasionally form in the perineum; and, from the frequent straining to which the patient is subjected in micturition, prolapse of the anus takes place, attended with relaxation of the sphincter muscle, inflammation and thickening of the mucous membrane, and hemorrhoidal tumors.

The orifices of the seminal ducts are, in many cases, dilated, or otherwise affected, and the ducts themselves may be variously altered. The seminal vesicles are sometimes atrophied, or diminished in volume, and changed in structure. When the neck or bas-fond of the bladder suffers much, one or both of these reservoirs may become acutely inflamed, and sometimes even gangrenous.

A calculus of the bladder has sometimes obstructed parturition, and required extraction before the labor could be completed. Such a case occurred in the practice of Dr. Monod,¹ in a woman of forty, pregnant for the first time. In a similar case, related by Mr. Thralfall,² of Liverpool, both mother and child were permitted to perish, in consequence of the nature of the obstruction not being detected until after death.

Finally, another effect, which has occurred in at least thirty-

¹ New York Journ. of Med. and Surg., p. 274, Sept. 1850.

² London Med. and Surg. Journ., vol. ii. p. 180, 1829.

six instances,¹ is the spontaneous fracture of the calculus, succeeded by violent irritation of the bladder, and sometimes even by the death of the patient. The sharp, angular, and rugged points of the fragments fret and irritate the mucous membrane, which is thus induced to take on inflammation, which is sometimes so intense and so unmanageable as to destroy life in a few days. Besides, some of the pieces may lodge in the urethra, and produce partial or complete retention of urine.

The immediate cause of fracture of urinary calculi within the bladder is no doubt the inordinate contraction of the muscular fibres of this organ. It may also be produced by the stones, especially if they be numerous, striking violently against each other during severe bodily exercise, as in leaping and running, and riding; and it has been known to follow sounding. In other cases, again, as in those recorded by Mr. Southam,² the accident was evidently due to the generation of gas within the calculus itself, from the decomposition of its mucous cementing material.

SECT. VII.—PROGNOSIS OF VESICAL CALCULUS.

A small stone is sometimes passed spontaneously, especially in the female, owing to the shortness and dilatability of the urethra in that sex. Cases have occurred in which riddance was effected by ulceration of the bladder, the concretion escaping at the groin, the hypogastrium, the perineum, the rectum, or the vagina. Such a termination is attended with severe local suffering, and constitutional disturbance. As a rule, the prognosis is favorable if the calculus be discovered at an early period, and steps are taken to get rid of it. If it is permitted to remain, it generally steadily increases in volume, and ultimately leads to serious organic disease of the prostate, bladder, ureters, and kidneys, which causes not only a great deal of suffering, but literally wears out the life of the patient.

Spontaneous fracture of a calculus is always attended with danger, although, in exceptional instances, a sort of natural cure may result through the discharge of the fragments by the ure-

¹ Otto Schmidt, *Beiträge zur Chirurgischen Pathologie der Handwerkzeuge*, Leipzig, 1865, pp. 1-31.

² George Southam, *British Medical Journal*, vol. i. 1868, p. 3.

thra. So fortunate an issue is not, however, to be anticipated; hence, no time should be lost in resorting to lithotomy. Even under these circumstances, the prognosis is not quite so good as when the ordinary operation is performed, since of eleven recorded cases of lithotomy for fractured calculus, two perished.

CHAPTER IX.

TREATMENT OF STONE IN THE BLADDER.

THE treatment of stone in the bladder necessarily divides itself into medical and surgical, of which the former is, in general, merely palliative, although frequently of paramount importance, whether it be considered only with reference to the temporary comfort of the sufferer, or as a means of improving his health with a view to his relief by an operation. Each of these subjects should be well understood, and it will, therefore, be proper to discuss them somewhat at length.

SECT. I.—MEDICAL TREATMENT.

Persons affected with stone in the bladder do not always find it convenient to submit to an operation, and it therefore becomes a matter of great importance to render them as comfortable as their circumstances may admit of. By attention to the general health, as regulated by food, drink, and exercise, much may be done to allay local suffering, and make the patient almost forget his disease. A concretion, which may have been a source of great distress for years, may, by appropriate and well-directed treatment, become a comparatively harmless tenant of the bladder, and thus a state of torture be converted into one of Elysium. Many cases are on record, in which, from the improvement of their symptoms, calculous subjects have imagined themselves cured of their ailments, when, in fact, the change they experienced was solely owing to the increased tolerance of the organ, in consequence of the effects of remedies. The improvement thus produced has sometimes lasted many years, although, in general, it is comparatively short. A consideration of this circumstance has led to a belief, not altogether unfounded, that urinary concretions are sometimes dissolved in the bladder, and voided along with the urine. Hence, certain remedies, supposed to be endowed with this property, have received the name of lithontriptics, or solvents and disintegrators of stone.

It is hardly necessary to remark that a due regulation of the diet is of paramount importance in the treatment of stone in the bladder. Most patients, in fact, know from painful experience, the kind of food and drink that agrees best with the stomach. In adults, therefore, little caution in this respect is necessary; but in children, who are unable to judge for themselves, the proper injunctions should always be given to the parents and nurses. Without entering into details, which the limits of this treatise forbid, it may be observed, in general terms, that the diet should be plain and simple, easy of digestion, and yet sufficiently nutritious. Plainly roasted meats, oysters, boiled fish, mealy Irish and dry sweet potatoes, well-boiled rice and hominy, soda biscuit, and stale wheat bread, with weak-tea, or milk and water, are, in general, the most suitable articles. Coffee, wine, and fermented liquors, cider, and subacid fruits, with pastry, and the coarser kinds of vegetables, are to be eschewed. If the patient be feeble, or has been in the habit of using liquor, a little brandy, or, what is better, gin, may be allowed at dinner, and after exercise. Gin, as is well known, has a sort of specific tendency to the urinary organs, and its exhibition is occasionally attended with good effects. Some persons are greatly benefited by hoptea, beer, or malt liquors. Generally speaking, however, these articles produce more harm than good. All kinds of water impregnated with lime must be abstained from, from their tendency to favor the increase of calculous deposits. The patient should be well clad, avoid exposure to wet and cold, and refrain from rough exercise of every description. In the winter, he should keep himself well housed, or reside, if possible, in a warm and genial climate. Sexual excitement must be carefully guarded against, for any indulgence of the kind is always sure to be followed by an aggravation of the complaint.

The urine must, in all cases, be kept in as neutral and diluted a condition as possible. When it throws down a copious deposit of urates, uric acid, or oxalate of lime, the patient should drink an abundance of water, as it is well known that these sediments rarely occur in excess when the fluids of the body are maintained in a state of dilution. If it be acid, alkalines are indicated; if alkaline, acids are required. Frequent examinations of this fluid are, therefore, necessary, in order that the remedies may be varied as the circumstances of each particular case may

render it proper. It should be remarked here that some patients are most benefited by alkalies, others by acids, even when the urine and the stone are both apparently of the same character. No satisfactory reason can be offered for this seeming discrepancy, with which every physician of experience is familiar. In my own practice, I have generally derived most benefit from the use of alkaline remedies, whatever may have been the nature of the diathesis or concretion.

The best alkalies in the treatment of vesical calculi are, beyond all question, the bicarbonates of soda and potassa, either alone, or variously combined with each other. In my own practice, I have generally given a preference to the soda, for the reason that it has seemed to me to exert a more obtunding effect upon the mucous surfaces of the urinary passages. The best form of exhibition is in solution in strong hop and uva ursi tea, in the proportion of thirty grains to an ounce, three or four times a day. The best period for using the medicine is about one hour after meals and at bedtime. Exhibited in this way, it readily mixes with the ingesta, prevents the evolution of acidity and flatulence, and exerts a more controlling influence over the urinary secretion. The quantity of the salt may be gradually increased to forty, fifty, and even sixty grains, according to the tolerance of the stomach; and a good plan is to premit the use of it occasionally for a few days. Carbonate of potassa is sometimes employed alone, but its beneficial influence is always greatly enhanced by giving it in union with soda. The liquor potassæ sometimes answers an excellent purpose in these cases, particularly in persons of a dyspeptic habit. It should be administered largely diluted with water, in doses varying from twenty to forty drops, three times daily, or, what is better under such circumstances, in combination with some of the simple bitters, as tincture of gentian, quassia, or cinchona. Some patients derive much benefit from the free use of lime-water, Castile soap, magnesia, and lye. The celebrated remedy of Mrs. Stephens, purchased more than a century ago, at an enormous expense, by the English government, consisted of Castile soap and egg-shells. During the height of its renown, and before its composition was disclosed, it was the fashionable medicine with calculous patients, of every condition and rank, in Great Britain; it was swallowed in large quantities, and

there is reason to believe that it often produced the most salutary effects.

Marked benefit, sometimes of a permanent character, arises from the long-continued use of certain mineral waters. Of the various waters celebrated for their virtues of solving calculi and soothing the bladder, those of Vichy, in France, are the most remarkable, on account of the numerous cases that have been relieved by their use. Their reputation extends back several centuries, and their efficacy has been corroborated by the testimony of some of the most respectable physicians of modern times. The Vichy waters contain a large quantity of free carbonic acid, and very nearly a drachm and a half of bicarbonate of soda in every thousand drachms of the menstruum, upon the presence of which their good effects no doubt depend. The probability is that these and similar waters act not as mere diluents, but that they also exert some chemical influence upon the urine. Whether any of the mineral waters found in such immense numbers and varieties in this country, possess virtues similar to those of the Vichy waters as stone solvents, experience has not determined. It is certain, however, that many calculous patients have derived much benefit from their use.

When the urine is decidedly alkaline in its character, acids are indicated, and it is remarkable how soon, in many cases, under these circumstances, their good effects become manifest, since they seldom fail to improve the condition of the digestive apparatus, to allay flatulence, and to promote the appetite, and, just in proportion as they do this, do they improve the state of the urinary organs. The length of time during which they should be continued must depend upon circumstances. I have found in my own practice that the alternate use of acids and alkalies is generally productive of more benefit in the treatment of calculous complaints than the protracted use of either of these substances alone.

The acids which are usually employed to produce these changes are the nitric, hydrochloric, and benzoic, of which the former is the preferable. The best form of exhibition is the dilute nitric acid of the shops, in doses of from twenty to thirty drops, three times daily, in nearly half a tumblerful of cold water, sweetened with a little sugar, to render it palatable. The sulphuric acid is also sometimes used, but its good effects are

less apparent, and occasionally it seems to be rather prejudicial than beneficial. Much improvement sometimes results from the exhibition of phosphoric acid; and cases occur in which marked relief follows from the use of certain vegetable acids, as the citric and tartaric.

SECT. II.—LITHOLYSIS.

The idea of dissolving stone in the bladder by means of injections is not new; but past experience and modern experiments conclusively show that phosphatic calculi are alone amenable to this form of treatment. Of the different remedies that have been recommended, the only ones entitled to confidence are the dilute nitric acid, and acetate of lead, in the proportion of about two drachms of the former, and sixteen grains of the latter, to the pint of water. Sir Benjamin Brodie,¹ as is well known, succeeded in dissolving two phosphatic stones by passing a solution of nitric acid slowly and steadily over them by means of a double catheter, for fifteen to thirty minutes every two or three days. More recently, Mr. Southam² tried the same method, with equal success, in a case of the repeated formation of fresh concretions after crushing a phosphatic calculus. In the course of a short time the old fragments were completely dissolved and the formation of new ones was prevented. This treatment is worthy of still further trial as an aid to lithotrity.

Some years ago Dr. Hoskins³ suggested the employment of nitrosaccharate of lead as a perfectly unirritating agent to dissolve phosphatic concretions, for which he afterwards substituted acetate of lead, with the addition of the merest trace of acetic acid, to secure solution of the salt. The idea is very ingenious, as a double decomposition ensues, which results in the formation of phosphate of lead and acetate of lead and magnesia, which are harmless to the mucous membrane of the bladder. The fluid may be allowed to remain in the viscus as long as it can be retained, or a slow current may be maintained through the bladder by means of a double catheter, connected by a gum tube to a reservoir elevated above the level of the bed.

I have no experience with this mode of treating stone, and I

¹ *Op. cit.*, pp. 306-311.

² *Dr. Roberts, Med. Chir. Trans.*, vol. xlviii. p. 183.

³ *Lond. Journ. Med.*, vol. iii. p. 891.

suppose few surgeons in this country have. Most of our calculous patients are from a distance, and are anxious, when they reach us, to be relieved as speedily as possible of their burden. Few have the time, or means, or patience, to submit to a process, which, while it must always be tedious and inconvenient, is generally uncertain, sometimes painful, and not always devoid of danger. The subject, however, is worthy of further attention, and it is to be hoped that it will be investigated in a manner commensurate with its importance.

Electrolysis has been applied to the solution of urinary calculi. This agent was first suggested, for purposes of this kind, by Bouvier Desmortiers, who actually performed some experiments with it, though the effects which he obtained were very tardy and unsatisfactory. The subject was afterwards taken up by Gruithuisen, Prevost and Dumas, Bonnet, Willis, O'Shaugnessy, Bence Jones, and other practitioners, with hardly any better success. Dr. Ludwig Melicher¹ is said to have been successful in two cases; but I am not aware of a single well-authenticated instance of disintegration of a calculus by the application of this agent. My own opinion is that little is to be expected from it, and that it would be a mere waste of time to resort to it.

SECT. III.—EXTRACTION OF CALCULI THROUGH THE URETHRA.

The fact that small calculi sometimes escape during micturition was long ago noticed by practitioners, and has been turned to good account by modern surgeons. When it is known, for example, that a concretion has recently descended from the kidney, its expulsion from the bladder may occasionally be effected by making the patient grasp the head of his penis, while he distends the urethra with urine; then, letting go his hold, he empties his bladder with all the force he can direct upon it by the action of the diaphragm and abdominal muscles. The water should be previously accumulated to the greatest possible extent, and during its evacuation the patient should lie upon his belly, or bend his body forward, to place the stone in the most favorable position for reaching the urethra. These attempts at extrusion are generally much facilitated by the prior dilatation of the canal by means of the bougie or catheter. The urethra,

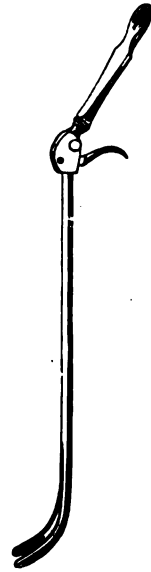
¹ Beale, *Kidney Diseases, etc.*, 8d ed., p. 430.

being thus expanded to a greater or less extent, will more readily admit the passage of the foreign body by the pressure of the advancing stream of water. When the concretion is quite small, a single introduction of the instrument will sometimes suffice; but, in general, systematic dilatation will be necessary, and this, it need hardly be added, should always be conducted with the greatest care and gentleness.

Attempts have been made, especially in recent times, to remove calculi entire from the bladder, through the urethra, by means of forceps. It was observed, long ago, that during catheterism, small concretions became occasionally impacted in the eyelets of the instrument, which they followed upon its withdrawal. A circumstance, so interesting and important, was well calculated to arrest the attention of surgeons, and we accordingly find that they have taken full advantage of it. It was in this way that the late Mr. George Bell, of Edinburgh, had the good fortune to rid a patient of one hundred and fifty concretions. In performing such an operation, a full-sized catheter with two large eyes should be selected, and the bladder should be previously distended with water, so that, as the fluid runs off, the calculi may have a better chance of being forced into the tube.

Instruments have been constructed for the special purpose of seizing the stone, and removing it entire. Sanctorius, if not the first, was one of the earliest surgeons who busied themselves in this manner. He has described the operation with some minuteness, and has figured a pair of forceps which he contrived for performing it. Hales, Hunter, and others also invented instruments, which have been greatly improved in modern times by Sir Astley Cooper, and some of the French lithotomists. The forceps of the English surgeon, which are represented in fig. 56, and with which he extracted upwards of eighty small calculi from one individual, consist of two movable blades, shaped, when closed, like a curved catheter. They are introduced in the ordinary manner, and are used, at first, as a searcher. When the stone is found,

Fig. 56.



Cooper's Forceps.

the blades are gently separated and expanded over it, when, being again shut, the instrument is carefully withdrawn. An index upon the surface of the instrument serves to show the size of the calculus, or, what is the same thing, the possibility of removing it entire. When the concretion cannot be extracted in this manner, it may, if not too hard or large, be crushed, and be disposed of piecemeal.

In performing this operation, it is important that the bladder should be perfectly free from irritation, that the urethra be previously dilated by the catheter or bougie, and that the forceps do not pinch the mucous membrane. If these precautions are neglected, serious mischief may follow. At least one instance is on record where death ensued, although the operation was performed by a competent surgeon, and the forceps were introduced only twice.¹

The removal of calculi by forceps is, for obvious reasons, peculiarly applicable to females. By rapidly dilating the urethra, concretions upwards of an inch in diameter may be extracted, without any subsequent incontinence of urine.

A small calculus has sometimes been entrapped and removed by a very simple procedure. Many years ago, Dr. Calvin Conant² relieved a lad, aged fifteen, by means of a silver wire, passed through a catheter, the vesical extremity of which was pierced by two holes, about a line and a half apart. The wire, which was very fine, elastic, and twenty inches long, was formed, upon its arrival in the bladder, into a loop, which was then moved about until the concretion was found and ensnared; the ends were next secured to the shoulders of the catheter, when both the instrument and stone were withdrawn.

SECT. IV.—LITHOTRITY.

It is not my intention, in this place, to enter into a history of lithotritry. It may suffice to state that it is really an Italian procedure, Santorio, in 1626, and Ciucci, in 1670, having devised instruments, similar to the trilabe of Civiale, with which they executed it. It appears, however, to have been lost sight of until 1814, when Gruithuisen, of Munich, proposed to reduce a

¹ Brit. and Foreign Med. Review, vol. xii. p. 404.

² Medical Repository, N. Series, vol. iv. p. 184. New York, 1818.

stone to powder by drilling. Elderton, of Scotland, six years subsequently, devised a curved lithotrite for the same purpose. From 1817 to 1824, Civiale was engaged in perfecting the trilabe and in conducting experiments, which culminated, in the latter year, in the successful performance of crushing a stone in the human bladder before a committee of the French Academy. To him is due the credit of having established the operation on a firm footing, and brought it to its present degree of perfection. Although it is certain that he obtained some hints respecting it from previous and contemporary experimenters, yet it must be evident to every impartial inquirer that the invention was the result mainly of his own labors and ingenuity.

The original instruments of Civiale and Jacobson have been replaced, chiefly through the suggestions of Weiss, Heurteloup, Costello, Hodgson, and Charrière, by the curved screw lithotrite, of which an excellent form, represented in fig. 57, leaves nothing to be desired. It is from twelve to fourteen inches long, and its shafts terminate, at one extremity, in the beak, which is composed of the male and female blade, and at the other, in a fluted cylindrical handle and a screw, turned by a wheel, which can be fixed or disconnected by sliding the button on the handle. The female shaft is grooved to receive the male shaft, which is provided with a scale for determining the volume of the stone.

Another form of power, which is useful when the stone will only yield to short and quick percussions, is that by the rack and pinion, represented in fig. 58, and invented by Sir William Fergusson. The modification of this instrument by Mr. Matthews, in which the shaft is very narrow and the beak bulbous, is a great improvement on the original pattern, as it permits of greater delicacy of touch and freedom of play in the bladder.

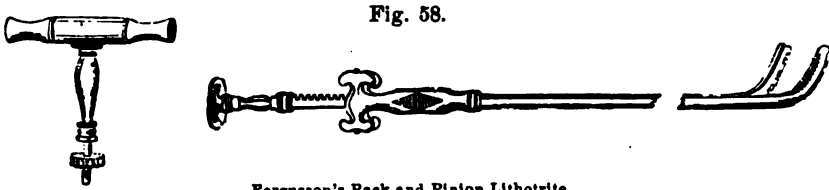
The operator should be provided with at least three instru-

Fig. 57.



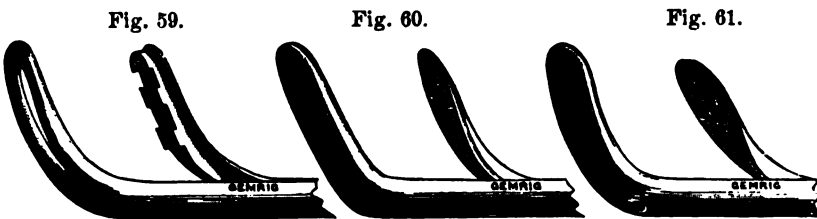
Weiss's and Thompson's Lithotrite.

ments; one with the female blade open, as represented in fig. 59, and the male blade denticulated, for breaking large and hard



Fergusson's Rack and Pinion Lithotrite.

stones into fragments; one with flat and roughened blades, of which the male is narrower than the female, fig. 60, for crushing calculi not above one inch in diameter, unless they are very friable; and a third with roughened blades of nearly equal width, fig. 61,



Different Forms of Lithotrite Blades.

for pulverizing fragments and small stones. The angle formed by the beak and the shaft need not exceed 105° or 110° ; while the diameter of the shaft of the most powerful lithotrite may equal 10 of the English catheter scale, and that of the two dimensions of the beak should measure 13. For small or friable concretions the respective diameters may equal 7 and 10.

The operator should also be provided with Fergusson's delicate scoops, and Clover's or Dittel's evacuating apparatus, for the removal of fragments; a gum bottle and catheter for injecting the bladder; and forceps, curettes, and lithoclasts, for the extraction of fragments impacted in the urethra.

Before subjecting a patient to lithotripsy, the conditions which favor, and those which oppose, the operation must be carefully weighed, since, under favorable circumstances, it is an eminently successful procedure in skilled hands, while, if it be resorted to indiscriminately, the loss of life will be far greater than after a cutting operation. It may be asserted that impubic subjects

are, for obvious anatomical reasons, not fit subjects for lithotritry; lithotomy leaving nothing to be desired at this period of life. The best cases for the procedure are adult males, with a fair state of the general health, a calculus which does not exceed one inch in diameter, and a sound condition of the genito-urinary organs, that is to say, a capacious and nonsensitive urethra, a normal prostate, a bladder capable of holding a few ounces of fluid, and freedom from renal complications. In such persons, who are, however, rarely met with in actual practice, crushing should be the rule, and cutting the exception. With regard to the nature, size, and number of the stones, it may be accepted, that uric and phosphatic calculi above one inch and a half in diameter, and oxalate of lime concretions more than twelve lines in diameter, are more safely dealt with by lithotomy; and the same rule appertains to sacculated, adherent, and multiple large calculi, although the crushing of numerous small stones forms no greater obstacle to success than dealing with so many fragments. Stricture of the urethra, unless previously overcome, and the full dimensions of the canal restored, is a decided contraindication. Simple enlargement of the prostate merely requires careful manipulations, and adds somewhat to the difficulty of seizing the stone, besides necessitating the removal of detritus by the evacuating apparatus. When the hypertrophy is not uniform, and projects mammillated processes into an irritable bladder, and the calculus exceeds one ounce in weight, particularly if it be composed of uric acid or oxalate of lime, lithotritry is not justifiable.¹ Malignant disease, papillary growths, ulceration, sacculation, acute inflammation, and a contracted and irritable condition of the bladder, are positive bars to the operation; while a mild chronic cystitis, which can be alleviated by appropriate measures, and is associated with a soft, small stone, is not a serious complication. Paralysis of the bladder renders its mucous lining much more tolerant of the presence of instruments, and is, therefore, not an unfavorable condition. In females above the age of puberty, the operation, in suitable cases, is preferable to lithotomy, pro-

¹ In a case of this description, under the care of the editor, acute cystitis and pelvic cellulitis terminated fatally on the fifth day after gentle manipulations. The man was 71 years of age, and had been lithotomized eighteen months previously. *Trans. Path. Soc. Phila.*, vol. iv. p. 153.

vided the calculus cannot be removed entire through the rapidly dilated urethra. Finally, lithotrity is inadmissible in organic disease of the kidney, in hyperæsthesia of the urethral mucous membrane, with a tendency to urethral fever, and in persons of feeble health, and of a nervous, irritable constitution.

Scarcely less important than the proper selection of cases, is the management of the patient previous to the operation. Under no circumstances, should the bladder be even explored, after a long journey, until the patient has recovered from the immediate effects of the fatigue and the local irritation which is almost sure to be set up by travelling. After the preliminary examination, which should be conducted gently and not extend over a period of more than two or three minutes, the prudent surgeon will wait for forty-eight hours, to see whether sounding is followed by rigors and febrile action. If the subject be in good health, and he has been kept in bed for six or seven days, and the urethra does not resent the previous instrumental exploration, and is sufficiently capacious to permit the free play of the lithotrite, the operation may be proceeded with without further delay. Unless these precautions be attended to, the surgeon will only have himself to blame in the event of failure or a fatal termination. Morbid sensibility of the urethra may be obtunded by the use of the conical steel bougie, along with weak injections of acetate of lead and opium, and the internal exhibition of bromide of potassium. Should the canal require dilatation, it is best effected with the same instrument, gradually increasing sizes being employed until the object is accomplished; and the meatus may be enlarged by a slight incision, if it be deemed necessary. The urine must be examined, with a view to detect organic renal changes; and any chronic cystitis that may exist should be met by appropriate measures until the bladder is enabled to hold about four ounces of urine with comfort. If the patient can retain his water for about two hours in the morning, that amount will have been secreted, and preliminary injection of the bladder will be rendered unnecessary. Anæsthetics are not generally required, as the operation is not painful if conducted with skill and celerity, and it is, moreover, desirable that the patient be able to inform the surgeon of any undue suffering.

During the operation, the subject should lie close to the right edge of a firm hair mattress, with the knees separated for about

twelve inches and supported by pillows, and the pelvis, which should be exposed as little as possible, elevated by a cushion two or three inches thick. The surgeon, standing on the right side of the patient, and with his back towards the head of the bed, raises the penis with his left hand, and inserts the beak of the lithotrite, the shaft of which rests on the palmar surface of the fingers of the right hand, held over the spine of the ilium, into the meatus, when he draws the penis over it, and permits the instrument, as he carries it towards the median line and gradually raises it into a vertical position, to find its own way to the triangular ligament. This point having been reached, the penis is drawn still farther upwards on the lithotrite which is now held at a right angle with the body of the patient, through which manœuvre the beak engages in the membranous urethra, when the handle is slowly depressed between the thighs and the beak passes through the prostatic urethra into the bladder.

The lithotrite having entered the bladder, the next step is to find and seize the stone, which may be done in two ways. In the first method, introduced into England by Heurteloup, and

Fig. 62.

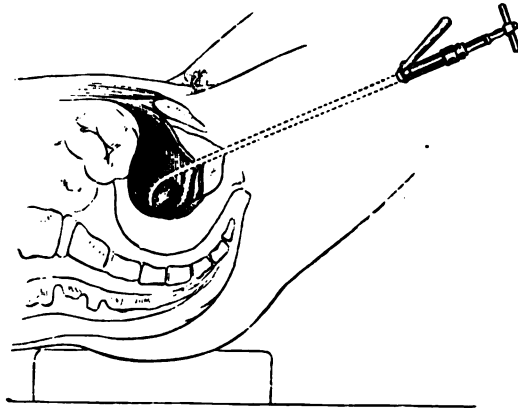


English Method of Seizing the Stone.

practised by Brodie, and hence known as the English method, the lithotrite is moved in the bladder as little as possible, and the fundus of the viscus is made the area of the early manipula-

tions. The handle of the instrument being elevated, the male blade is withdrawn, and the female blade is pressed against the *bas-fond* of the bladder, as represented in fig. 62, from Bryant, when the stone falls between the blades. Should it not do so, a number of quick percussions should be imparted to the bladder, by giving the instrument a shake, or tapping it with the fingers, with a view to dislodging the calculus. In the second and better method, which was practised by Civiale, and is shown in fig. 63, from Bryant, the instrument is made to grasp the stone

Fig. 63.



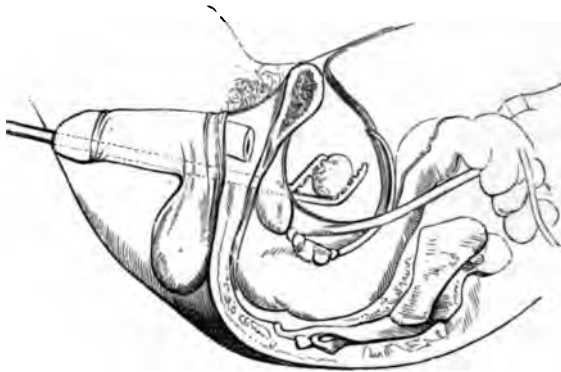
French Method of Seizing the Stone.

in the situation in which it may be detected, contact with the walls of the bladder being avoided as much as it is possible. If the calculus is felt as the lithotrite enters the bladder, the beak is turned slightly away from it, when the female blade is propelled onwards and the male blade withdrawn. The blades are now inclined towards the stone, which is almost always readily seized, when they are closed. Should the concretion not be felt as the instrument enters, the latter must be carried to the centre of the bladder, where the blades are separated and carried about the eighth of a circle to the right and closed. This failing, a similar manœuvre is practised towards the left side. Should the concretion not be seized, the blades are to be slightly raised from the floor of the bladder by depressing the handle of the instrument, opened, and turned about 90° or one-fourth of a circle, to the left, and closed, then to the right, and closed.

Executed in this way, these manipulations will rarely fail to detect a calculus. When the prostate is enlarged, when the patient is very corpulent, or in searching for fragments or small concretions, the pelvis must be elevated from four to six inches, and an instrument with short blades be used, in order that they may be reversed. The handle being still farther depressed, and the blades separated, and brought to the horizontal position, the latter are turned, as before, first to the right, then to the left, and finally, completely reversed. When the stone is large and is lodged in a pouch behind the prostate, unless the male blade is fixed at the neck of the bladder and the female blade projected onwards, failure is inevitable.

The calculus, having been seized and raised to the centre of the bladder, as shown in fig. 64, is fixed by changing the sliding into the screwing action by drawing the button towards the handle, and giving the wheel a slow turn. By increasing the power, the stone soon breaks into several fragments, when the screwing

Fig. 64.



Position of Stone for Crushing.

motion is converted into the sliding motion, and the male blade withdrawn, and the larger fragments successively attacked. Not more than two minutes, however, should be occupied by the first sitting. The instrument is now carefully removed, care being taken that no fragment or detritus is contained between the blades, as may be ascertained by a glance at the scale on the male rod. Should there be any impaction in the female blade, it may be gotten rid of by rapidly forcing the male blade in and out by alternating turns of the screw.

The patient is put to bed immediately after the operation, wrapped up warmly, and kept recumbent, in which position he is to pass his water, for at least forty eight hours, to prevent sharp fragments being forced against the vesical orifice of the urethra. A hot toddy, and a hypodermic injection of one-third of a grain of morphia, will materially aid in warding off rigors; his diet should be light, and he should be allowed an abundance of diluent drinks. As soon as the detritus has ceased to come away with the urine, which usually happens in four or five days, provided there be no contraindications, the operation should be repeated, with a lithotrite with plain blades; and the succeeding sittings may follow at short intervals and be prolonged to four or five minutes. The pulverization of the last fragments requires great manipulative skill, and should be practised with a lithotrite with short and wide plain blades, used in the reversed position, if they are not seized in the ordinary manner. If any fragment remains behind, its presence will be denoted by a little pain and the escape of a drop or two of blood at the end of micturition, these symptoms being increased by rough exercise. Instead of pulverizing the fragments and permitting the detritus to come away by the unaided efforts of nature, Sir William Fergusson prefers, as it greatly expedites the cure, to extract them by means of his delicate scoops. Up to 1867, he had treated sixty cases in this way, and removed some unusually large fragments, with the effect, however, of lighting up considerable irritation of the neck of the bladder.

The practice of injecting the bladder to wash out detritus is obsolete. In cases, however, of enlarged prostate and paralysis of the organ, its contents cannot be discharged without extrinsic aid. Under these circumstances, Fergusson's scoops, or Dittel's or Clover's evacuating apparatus, may be employed to remove the fragments. The apparatus of Mr. Clover is composed, as seen in fig. 65, of an elastic bottle, attached to a glass reservoir, into which the evacuating catheter projects about one inch. Having passed the catheter and drawn off the urine, the bottle, filled with warm water, is attached, and the catheter gently pressed against the bottom of the bladder. The bottle is alternately slowly compressed and rapidly expanded, the outward current bringing with it the fragments, which fall into the glass cylinder. Should the stream stop, the current must be reversed, to send

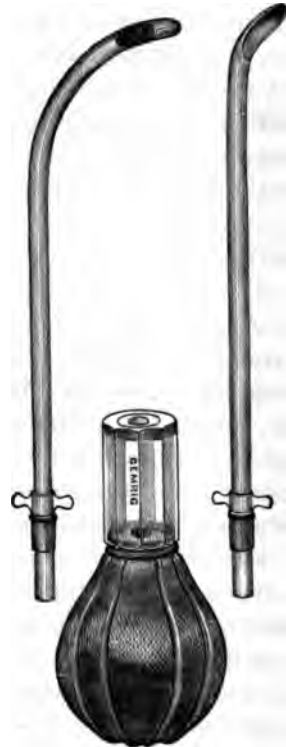
back any large fragment, that may obstruct the catheter, into the bladder. This apparatus should not be employed, if it be possible to dispense with it, as its use is quite as irritating as lithotripsy itself. For this reason, evacuation of the debris by means of Professor Dittel's¹ siphon contrivance is preferable. A long piece of rubber tubing is fitted to the end of the catheter, while the other extremity rests in a receptacle placed on the floor. A valvular arrangement permits an inward current of water, while the outflow depends upon atmospheric pressure.

The accidents and bad effects of this operation are: rigors and fever; contusion and laceration of the urethra; impaction of fragments of the calculus in that canal; prostatitis; epididymitis; cystitis; peritonitis; pelvic cellulitis; renal irritation; pyemia; atony of the bladder; hemorrhage; perforation of the bladder; and fracture of the lithotrite.

There are few persons who do not suffer from rigors, or an attack of urethral fever, after the procedure, particularly if the preparatory treatment has not received due attention. They are rarely of serious import when they come on almost immediately or within a few hours; but should they occur after the lapse of forty-eight hours, they may denote an outbreak of pyemia. The occurrence of rigors should be guarded against by strict recumbency, warmth, a brandy toddy, and a full opiate after the operation.

Contusions and lacerations of the urethra will be most likely to take place when there is a disproportion between the diameter of the canal and that of the instrument, especially if the surgeon has little experience in operating; when the patient is restless

Fig. 65.



Clover's Evacuating Apparatus.

¹ Practitioner, March, 1871, p. 129.

and unmanageable; or when the stone is unusually large and firm. If proper precautions be used, the accident can scarcely happen.

A fragment of the broken calculus is sometimes arrested in the urethra, where it either simply produces retention of urine, or, in addition, more or less irritation of the mucous membrane. If the piece is sharp and angular, serious mischief may ensue before it is finally dislodged. If it is situated far back, an attempt should be made to push it into the bladder with a catheter or a stream of water; or these failing, it should be removed by a median incision. If it has advanced considerably forwards, it may be extracted with a curette, or the forceps delineated in the chapter on Foreign Bodies in the Urethra.

A not uncommon accident after lithotrity is the occurrence of traumatic cystitis, from the irritation excited by sharp and angular fragments. Instead of resorting to the usual remedies to combat the inflammation, Sir Henry Thompson¹ has recently, and I think very wisely, recommended that the patient be placed under the influence of an anæsthetic agent, and the fragments crushed freely, and the detritus removed by Clover's apparatus. Under this management rapid amelioration of the symptoms ensues. Another point to which this practised operator calls attention, is that unchecked inflammation of the bladder is liable, particularly in elderly subjects, to lead to inability on the part of the patient to empty his bladder, whereby the symptoms are kept up. The smallest quantity of urine retained in the viscus, after each act of micturition, leads to chronic cystitis and phosphatic deposit. The treatment is to cut short the cystitis by crushing the irritating fragments, and the methodical introduction of Mercier's catheter, by which the bladder may be completely drained of its contents.

Prostatitis, epididymitis, peritonitis, and pelvic cellulitis may occur after the most gentle manipulations; but they need not be anticipated unless the sitting be prolonged or is productive of suffering. They should be treated on general principles.

One of the worst effects of the operation, and one of the most frequent sources of death after its performance, is renal inflammation, followed by suppression of urine, and uremic intoxication.

¹ London Lancet, Jan. 8, 1876.

It is most common in elderly, irritable subjects, as a consequence of antecedent organic changes in the kidneys, which were difficult or impossible of detection during life. The chief remedies are, quinine, milk punch, and diaphoretics, with cupping and hot fomentations to the loins.

Next to renal disorders, the most frequent cause of a fatal issue is pyemia. The disease is usually very stealthy in its character, and affects principally old subjects, and those who are enfeebled by dissipation and protracted suffering. Our principal reliance is on quinine, opium, stimulants, nourishing food, and free incisions when abscesses have formed.

Atony of the bladder, with retention of urine, is liable to occur in elderly persons, either from the shock received by the viscus during the operation, whereby its muscular fibres are temporarily paralyzed; or from tumefaction of the prostatic urethra. This symptom is not in itself of dangerous import; but it should never pass unheeded, lest the accumulation of urine proceed too far, and thereby seriously jeopard life from cystitis, accompanied with a low form of fever and great prostration. The proper remedy is the catheter, employed at stated intervals.

Hemorrhage is not an infrequent attendant upon the operation; but it is rarely profuse or alarming. In the event of its occurrence, it should be treated on the principles laid down elsewhere.

Perforation of the bladder has sometimes happened in the hands of the most skilful operators. The same thing has repeatedly occurred in lithotomy, so that it cannot, with propriety, be urged as an objection against lithotrity. The accident, which is a most serious one, as it is usually followed by infiltration of urine and death, may be caused by the instrument itself, or by a sharp corner of a fragment of the calculus.

A very annoying accident is fracture of one of the blades of the lithotrite, which necessitates attempts at its removal by the forceps or by cystotomy. As the instruments of the present day are cut out of solid pieces of steel, and are properly tested, little need be feared from this source of embarrassment.

As a substitute for ordinary lithotrity, when the calculus is voluminous or very hard, or when the bladder is irritable, or there is a predisposition to urinary fever, Professor Dolbeau¹

¹ De la Lithotritie Périnéale, Paris, 1872.

practises median incision of the membranous urethra, dilates the prostatic portion of the passage and the neck of the bladder, by means of an instrument composed of six branches, crushes the stone with powerful forceps, and at once removes the fragments with small forceps and the scoop. He has performed the operation, which he terms perineal lithotrity, but which differs only from lithectomy in removing the calculus piecemeal, thirty times with five deaths, and does not limit its application to any particular period of life. He claims for it certain advantages; but that it possesses any over lateral lithotomy, under the same circumstances, I am at a loss to perceive.

The results of lithotrity are most encouraging, but they vary in the hands of different operators. The operation cannot fairly be compared with that of lithotomy, since the cases are selected with great care, and are those which are most favorable for the latter procedure. From the subjoined table of 1470 cases, the mortality is seen to be 1 in 9.30.

Sir Henry Thompson . . .	201 cases,	17 deaths, or 1 in 17.11
Sir Benjamin Brodie . . .	115 "	9 " 1 in 12.77
Sir William Fergusson . . .	109 "	12 " 1 in 9.08
Dr. Keith	123 "	8 " 1 in 15.25
Dr. Ivanchich	100 "	13 " 1 in 7.69
Dr. Swalin	49 "	7 " 1 in 7
Dr. Buck	55 "	8 " 1 in 6.87
Mr. Crichton	122 "	8 " 1 in 15.25
Mr. Key	12 "	3 " 1 in 4
Leroy	116 "	11 " 1 in 10.55
Cazenave	52 "	8 " 1 in 6.5
Balassa	30 "	5 " 1 in 6
Billroth	8 "	3 " 1 in 2.66
Norfolk and Norwich Hospital	34 "	3 " 1 in 11.33
Guy's Hospital	25 "	6 " 1 in 4.16
Moscow Clinic	62 "	6 " 1 in 10.33
Guersant	21 "	6 " 1 in 3.5
Pennsylvania Hospital . . .	14 "	2 " 1 in 7
Porta	133 "	24 " 1 in 5.54
	1470	159 1 in 9.30

Of the cases occurring at the Moscow Clinic and the Pennsylvania Hospital, and in the practice of Guersant and Porta, 106 were in children.

The mortality of 5014 lateral lithotomies in the private and hospital practice of American and European surgeons, was 434,

or 1 in 12.92. Hence, if a comparison be made between the two operations, as practised at all ages, the recoveries are in favor of lithotomy. More than one-half of the cutting operations were performed below the age of fifteen, or at an epoch notoriously fitted for lithotomy and unfitted for lithotrity. In adult subjects, the results are far more favorable to crushing. Thus, the cases of Thompson, Brodie, Fergusson, and Keith, in the foregoing table, occurred in male adults, and exhibit a loss of 1 in 13.84; while of 723 lateral lithotomies, tabulated by Sir Henry Thompson, in the same class of patients, 1 in 4.82 proved fatal. A comparison of the two procedures, in adults, as practised by the same surgeons, leads to similar results, since of 231 cases of lithotrity in the hands of Keith and Fergusson, 20, or 1 in 11.55, died, while of 296 lithotomies, 75, or 1 in 3.94, were fatal.

What a careful selection of cases is capable of accomplishing for calculous cases is clearly shown by the results of the practice of Sir Henry Thompson. Of 291 operations, only 17, or 1 in 17.11, died; and he had a succession of 51 elderly cases without a single death. The youngest patient was twenty-two years old, and the eldest eighty-four, with a mean age of upwards of sixty. Not a single case was left unfinished. Of his last 87 cases, of which 4 were fatal, he has been enabled to trace the relative condition of 45 to a period varying from thirteen months to two years and a quarter after the operation. Eleven have since died, six of urinary disorders. Of the 34 living, 28 are enjoying good health at a mean age of sixty-three and a half years; and 6 have some signs of recurring calculus, two having had a newly-formed concretion removed.

In estimating the comparative value of the two operations, it must not be forgotten that relapse is about five times more frequent after lithotrity than lithotomy, which is doubtless due to the difficulty in removing the last fragment, which becomes the nucleus of a new formation, in the former procedure. Thus in the practice of Thompson it occurred once in every twelfth case, and in that of Civiale once in every tenth. In the Norfolk and Norwich, Luneville, and Charité Hospitals, the Hospital of Incurables, at Naples, and the Saharunpore Dispensary, India, on the other hand, stone recurred sixty-two times in thirty-eight hundred and two cases of lithotomy, or once in every sixty-one cases. My own experience has afforded me only three instances of recurrence in 140 cases.

SECT. V.—LITHOTOMY.

It would be an endless task to give an account of the various operations of lithotomy, as they have been practised by different surgeons in different ages and in various parts of the world. Hence, I shall content myself with an account of a few of the more important operations, as they are performed by the most eminent surgeons of the present day. These are the lateral, bilateral, median, suprapubic, and recto-vesical.

Lithotomy may be performed at any period of life. Experience, however, has established the interesting and important fact that the greatest number of recoveries take place in children and in subjects under thirty years of age. Persons after this time of life are more prone to suffer from inflammation of the urinary apparatus, shock to the sexual organs, erysipelas of the wound, and phlebitis of the neck of the bladder and prostate gland. Infancy and childhood are peculiarly propitious for the operation. The disease, at this period, is usually free from complications, both local and constitutional; the wound made by the knife readily heals; traumatic fever seldom runs high; and there is little or no danger of urinary infiltration, erysipelas, phlebitis, or peritoneal inflammation. Other advantages are the absence of mental anxiety, and anticipation of an unfavorable issue, circumstances which often exert an unhappy influence upon lithotomy in adults.

It need hardly be said that every patient, about to undergo lithotomy, should be subjected to a certain degree of preparatory treatment, in order to place him in the best possible condition to bear the shock and other ill effects of the operation. There is no doubt that much of our success depends upon the manner in which this is done. The amount of this preliminary treatment must necessarily vary in different cases, and does not, therefore, admit of precise specification. When the patient is in good general health, as is evinced by the state of his complexion, appetite, sleep, and digestion, he will seldom require anything more than a dose or two of aperient medicine, and abstinence from animal food, with rest in his room. Four or five days will, in fact, generally suffice to put him in a proper condition for the operation. But it is very different when he is in bad health. Here a more thorough course of preparatory

measures is necessary. The secretions must be rectified, the urine must be brought as nearly as possible to the healthy standard, the bowels must be opened by mercurial and other cathartics, the diet must be regulated, and, in a word, all sources of excitement, local and constitutional, must be removed. When these objects have been attained, then, and not until then, will it be proper to subject the patient to the knife. Too much preparation, however, should be avoided; for it is as bad as too little; indeed, if anything, worse.

No surgeon having a proper regard for his own character and the dignity of his profession, would be likely to operate in case the patient is affected with organic disease of the lungs, or of any other important viscera. Serious lesion of the kidneys, ureters, bladder, and prostate gland also forbids interference. In short, whenever the health is broken down by previous suffering, not solely dependent upon the presence of the urinary concretion, the judicious surgeon will hesitate not a little before he will resort to the knife.

Persons affected with Bright's disease are particularly bad subjects for operations for stone in the bladder, by whatever method they may be executed. The existence of this form of renal disease may not, in its earlier stages and milder grades, militate against the performance of an operation; but at a later period no interference whatever is justifiable; the prognosis is unfavorable, and no care that can be bestowed upon the patient will be likely to save him. Fortunately, the means of verifying the presence of this disease, even at a very early period, is no longer a matter of doubt or difficulty. The scanty quantity, diminished density, and highly coagulable condition of the urinary secretion, along with the presence of tube casts, the feverish excitement of the system, the steady wasting of the flesh and strength, the pain and tenderness in the lumbar region, the frequent micturition, and the tendency to, or actual existence of, dropsical effusion in various parts of the body, are unmistakable signs of the coexistence of the two affections.

ART. I.—LATERAL LITHOTOMY.

Of the different operations for stone, the lateral is by far the most important, not only on account of its greater frequency,

but also on account of the remarkable success which has hitherto attended it. In the description which I am about to give, I shall speak of it as I am myself in the habit of executing it, premising that this does not differ, in any essential particular, from the method devised and so happily practised by Cheselden and his disciples.

The design of the lateral operation is to make an opening on the left side of the perineum, extending from the surface of the skin through the prostate gland and the neck of the bladder, and large enough to admit of the easy extraction of the foreign body. It is usually described as consisting of three steps, or stages. In the first, the surgeon divides the skin, the connective tissue, and the superficial perineal fascia; in the second, the transverse muscle, the triangular ligament, and the membranous portion of the urethra; and in the third and last, the prostate gland, and the neck of the bladder.

The wound made in the operation may be said to represent a truncated cone, the apex of which corresponds with the neck of the bladder, and the base with the surface of the perineum. In the adult, its extent externally varies from three inches to three inches and a half, while internally it does not, as a general rule, exceed eighteen or twenty lines. Its superior angle is an inch and a quarter above the verge of the anus, and immediately on the left side of the raphé of the perineum; the inferior, on the contrary, is usually about three-quarters of an inch to an inch below the anus, and a little nearer to the tuberosity of the ischium than to the outlet in question. The inner wall of the wound corresponds with the middle line of the perineum; the external, with the ramus of the ischium and the erector muscle of the penis.

a. Mode of Operating.—The evening before the operation, a brisk purgative is administered, to clear out the alimentary canal. The article which I usually select for this purpose is castor oil; but if there be disorder of the secretions, as indicated by the state of the tongue and stomach, a combination of calomel and rhubarb with a few grains of jalap is to be preferred. If the rectum has not been thoroughly evacuated, a stimulating enema, consisting of tepid salt water, or strong soapsuds, is used a few hours before the operation. I consider it of paramount importance, both as it respects the safety of the lower bowel,

and the comfort of the surgeon, that this precept should be faithfully attended to in all cases. Moreover, by opening the bowels freely immediately before the operation, there will be no necessity, as a general rule, for any purgative medicine for two or three days after. The operation should always be performed late in the morning, in order that the surgeon may have a good light, not only at the time, but subsequently, if any untoward occurrence, such as hemorrhage, should arise. The patient's breakfast on the day of the operation should be as light as possible, especially if it be designed to give him chloroform.

The urine should be retained for several hours before the operation; for a certain degree of distention of the bladder is necessary to prevent injury of its walls, and facilitate the extraction of the foreign body. If he be a child, and cannot hold his water without great difficulty, a piece of tape should be tied loosely around the penis; otherwise he will be sure to disobey an injunction which every lithomist must regard as of no little consequence. In old subjects, affected with excessive irritability of the bladder, with a constant desire to micturate, it is necessary to inject the organ with a few ounces of tepid water just before commencing the operation.

During the operation the patient lies upon his back, on a narrow table, about four feet in length, and provided with stout, firm legs, to prevent it from shaking. It is covered with a folded blanket or comfortable, over which are spread, first, a piece of soft oil-cloth, and next, a folded sheet. Several pillows are required for the head and shoulders, which, however, should be but slightly raised, otherwise the abdomen will be doubled up, and unduly compress the bladder. The breech is fully exposed to the operator, and is therefore brought well down, a little over the edge of the table.

Two stout worsted bands, from six to eight feet in length by two inches and a half in width, are required to bind the patient's limbs, unless he be anæsthetized, when they are not needed. They should each have a hole in the middle to afford greater security against their slipping; or they may be arranged as in fig. 66. As a preliminary step, the patient, stripped to his shirt, and placed upon the table, is desired to grasp his feet in such a manner as to apply his fingers to the sole and the thumb to the instep; in which position they are confined by means of the

fillets, passed around them in the form of the figure 8, the ends being tied in a double knot, or fastened with stout pins. This

Fig. 66.



Fillet.

duty is generally confided to the assistants, for which reason it is often discharged so badly as to be followed by much delay and annoyance; the patient, perhaps, becoming untied during the operation. A careful supervision should, therefore, always be exercised in this respect by the surgeon.

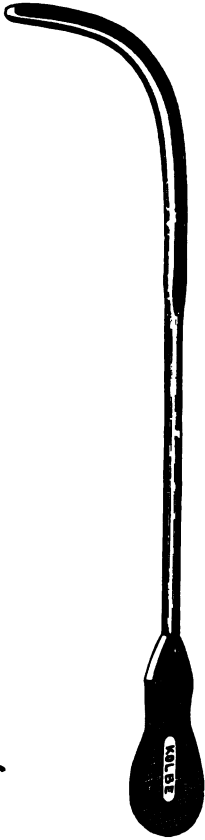
The limbs, being bound or not, as the case may be, are given in charge of two assistants, who, one standing on each side of the patient, place one hand upon the top of the knee, and the other beneath the sole of the foot. When the operation is about to be commenced, the thighs are moderately separated from each other, and held nearly at a right angle with the trunk. It can be easily perceived how important it must be, in reference to the speedy and successful execution of the operation, that the patient's limbs should be thoroughly controlled, and out of the surgeon's way.

It is usually recommended that the staff should be introduced previously to the ligation of the patient; but to such a procedure I am altogether averse, because it is productive of serious annoyance to the patient, and is almost sure to be followed by a premature escape of the urine. Besides, it is a source of inconvenience to the persons who have charge of the limbs. My rule, therefore, always is to tie the patient first, and immediately after to introduce the staff; taking care to confide it to a good, intelligent assistant, one who is thoroughly acquainted with the anatomy of the pelvis, and the different steps of the operation. During the operation, the instrument is to be held perpendicularly, with the handle nearly at a right angle with the trunk, and inclined slightly towards the right side. The curved portion, securely lodged in the bladder, is hooked up closely against the pubic symphysis. The object of this advice is to prevent the instrument from pressing upon the rectum, which would thus be in danger of being wounded. By inclining the handle of the staff a little towards the right groin, the curved portion is made to bear against the left side of the perineum,

with the effect of rendering it somewhat prominent and thereby facilitating the division of the membranous portion of the urethra. The assistant having charge of the instrument stands on the left side of the patient, in order that he may use his right hand, and also hold the scrotum out of the way.

The staff, represented in fig. 67, is made of steel, and is about ten inches in length, exclusive of the handle, which should be

Fig. 67.



Grooved Staff

Fig. 68.



Lithotomy Knife.

Fig. 69.



Beaked Knife.

at least two inches long by two lines and a half in thickness and fifteen lines in width, and perfectly rough on the surface, that it may be the more securely held in the hand. The groove, placed a little towards the left side, and extending from near

the middle of the instrument to within a short distance of its beak, should be perfectly smooth, and as deep and as wide as possible. It is warmed and oiled, previously to its introduction, like an ordinary catheter, and should be large enough to distend the urethra to as great a degree as is compatible with the patient's comfort. By adopting this advice, the surgeon will find it comparatively easy to find the staff, and effect, in a safe and proper manner, the division of the prostate gland and the neck of the bladder. With the straight staff of Mr. Aston Key, which is the form of the instrument usually employed at Guy's Hospital, I have no personal experience.

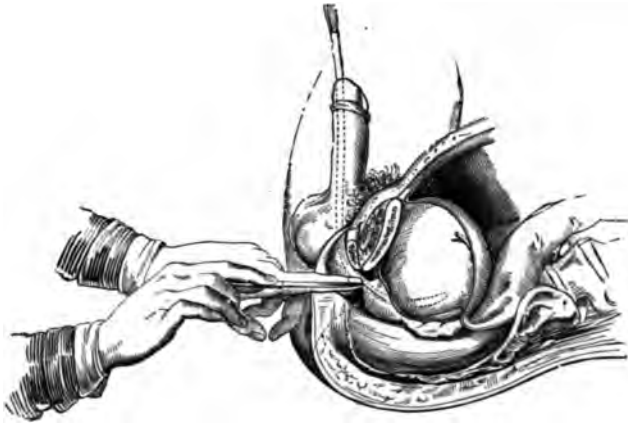
The surgeon, during the operation, sits upon a low, firm chair, or stool, as he may find it most convenient. Or he may place himself, as I usually do, in the half-kneeling posture, resting upon the right knee. I generally prefer this posture, because it affords greater freedom to my hands and elbows, by placing them, as it were, in a more depending situation. To protect his person and clothes from blood, urine, and feces, he should wear a long India-rubber apron. A piece of old carpet, or a sheet, is laid upon the floor, under the patient's breech, to receive the fluids.

The knife which I have, for many years, been in the habit of using, is the one sketched in fig. 68. It is very light and slender, sharp-pointed, and nearly seven inches in length, of which three are occupied by the blade, which hardly exceeds two lines in width. For enlarging the opening in the prostate and neck of the bladder, after the withdrawal of the staff, I sometimes use the probe-pointed bistoury, delineated in fig. 69, although the former instrument is quite as safe, provided the extremity be carefully guided along the index finger as it lies in the bottom of the wound. Instead of the ordinary knife, some surgeons still prefer the gorget or single lithotome caché, for making the deep incisions. Although these instruments have almost fallen into desuetude, the former will serve a useful purpose when the depth of the perineum is greatly increased by an enlarged prostate.

Everything being thus prepared—the rectum cleared out, the instruments arranged on a tray, the limbs tied and held out of the way, the staff in the bladder and in the hand of the assistant, the breech projecting over the table, and the patient fully under

the influence of chloroform—the operator is ready to begin. Introducing the index finger, well oiled, into the bowel, to induce it to contract, and to enable him to ascertain the position of the staff, and marking with his eye the situation of the tuberosity of the ischium, he stretches the integument of the perineum with the thumb and fingers of the left hand, and commences his incisions. The knife is entered just by the side of the raphé, on the left half of the perineum, an inch and a quarter above the margin of the anus, and is carried obliquely downwards and outwards, a short distance below the tuberosity of the ischium, and a little nearer to this point than to the anus. If the part is unusually full, the instrument is plunged in at the first

Fig. 70.



The Finger and Knife in the Groove of the Staff.

stroke to the depth of at least one inch; otherwise it must be used more cautiously. As the knife descends, it is gradually withdrawn from its deep position, so as to give the wound a sloping appearance. The length of the incision must be regulated by the size of the perineum and the age of the patient; but, in the adult, it should not, in general, be less than three to three inches and a half. In the young subject it must be proportionately smaller.

Placing the point of the left index-finger in the upper angle of the wound, the knife is reëntered just by the side of it, and is made to divide, by repeated touches with its edge, the superficial perineal fascia, the transverse muscle, and a portion of the

triangular ligament, with a few of the fibres of the elevator muscle. The membranous portion of the urethra being thus exposed a little in front of the prostate gland, the surgeon feels for the groove of the staff, at the bottom of the wound, and having found it, he cuts into it through the denuded tube, as in fig. 70. The length of the opening in the urethra need not exceed the third of an inch.

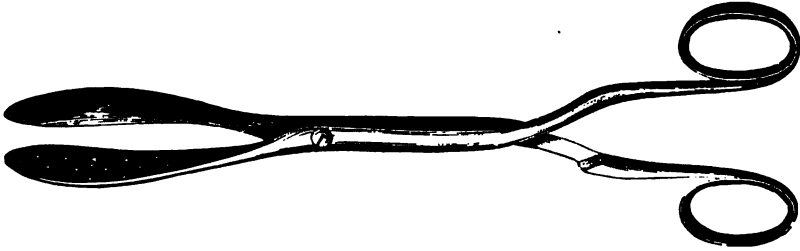
The knife, inserted into the groove of the staff, through the opening in the urethra, is now carried on into the bladder, dividing, as it passes along, the neck of the organ and the left lobe of the prostate, in a direction obliquely downwards and outwards, which is in that of its long axis. In executing this step of the operation, the rectum is to be held out of the way, by pressing it over towards the right side with the left index-finger, which should be steadily kept in the bottom of the wound, from the moment of the first incision. Great care should also be taken not to prolong the incision in the prostate gland too far back, for fear of penetrating the reflection of the pelvic fascia and the adjacent venous plexus.

As soon as the bladder has been opened, the urine escapes, generally in a gush; the knife is now removed, and the finger, lying in the bottom of the wound, is carried into the bladder along the staff, which is immediately withdrawn. The urine, as it passes off, frequently forces the calculus down against the artificial opening, so as to afford the surgeon an opportunity of ascertaining its form and bulk. When this does not happen, the finger is carried into the bladder to its full length, and used as a searcher. If the stone is found to be disproportionately large, the wound must be immediately dilated, either with the finger or the bistoury, according as the resistance may seem to depend upon the prostate or the muscular structures. In elderly subjects, the instrument will generally be necessary, as the gland is not sufficiently lacerable to yield to pressure.

The incisions being completed, the next step of the operation is to extract the calculus. This is done with the forceps, fig. 71, which are conveyed into the bladder along the upper surface of the index finger, lying in the bottom of the wound, in contact with the foreign body. The forceps are introduced with the blades closed, and are used at first as a searcher. As soon

as they are brought in contact with the concretion, the blades are expanded over it, in the direction of its long axis, and with

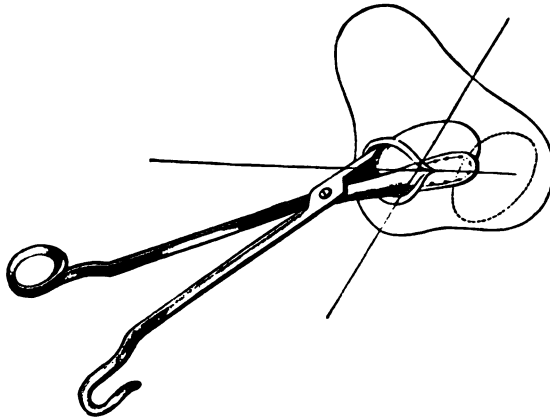
Fig. 71.



Lithotomy Forceps.

a firm grasp, as seen in fig. 72, to prevent the risk of slipping. Taking care that the instrument does not embrace any of the folds of the mucous membrane, the operator endeavors to extract the foreign substance by gently moving the forceps from side to

Fig. 72.



Mode of Seizing and Extracting the Stone.

side, or upwards and downwards, on the same principle as in the delivery of the child's head. The facility with which the stone may be seized depends upon circumstances. In general, it lies in contact with the inner extremity of the wound, and may be readily caught in the embrace of the blades of the instrument. Sometimes, however, as when it is lodged in the bas-fond of the

organ, it refuses to come down, and may thus embarrass the young operator. The difficulty, as will be particularly mentioned hereafter, is easily remedied by inserting the finger into the rectum, and pushing the concretion forwards against the forceps. When the stone is situated in the superior fundus of the bladder, the forceps must be carried high up, in the direction of the long axis of the pelvis, where they are to be moved about as a searcher. Occasionally, it lies behind the pubic symphysis, and cannot be seized until it has been dislodged by pressure upon the inferior part of the hypogastric region, aided by the finger in the bladder.

If the calculus is very small, it is sometimes more easily extracted with the scoop, fig. 73, than with the forceps. The same

Fig. 73.



Lithotomy Scoop.

instrument should also be used when the concretion has been broken, whether accidentally or designedly, into fragments, which must then be removed piecemeal. The scoop is about ten inches in length, and is shaped, as its name indicates, at each extremity, like a spoon. An instrument like this may be made very serviceable in extracting an adherent, encysted, or impacted concretion.

As soon as the foreign body has been extracted, the bladder is washed out with tepid water, thrown up in a full stream from a large syringe. Any pieces or fragments that may have escaped the forceps or scoop are thus removed; otherwise there will almost certainly be a return of the calculous affection, the smallest particle frequently serving as a nucleus for a new concretion. The syringe which I prefer is capable of holding twelve ounces, and is provided with a nozzle, four inches in length, slightly curved to adapt it to the axis of the pelvis, and terminating in a small ivory ball, perforated by several small eyelets. The bladder having been washed out in the manner here mentioned, a female sound is next introduced through the wound into the interior of the viscus, and used as a searcher with the view of ascertaining whether any stones or fragments have been left behind. Should this be the case, the forceps, scoop, and syringe

are again used till complete clearance is effected. In general, when the stone is rough, it is an evidence that it is solitary; but to this rule there are occasional exceptions. The operation being finished, the patient is unbound, and conveyed to his bed, a piece of oil-cloth and a folded sheet being placed under his breech, to protect the clothing, and absorb the urine.

β. *Extent of the Incision of the Prostate.*—There is probably no subject connected with the lateral operation of lithotomy respecting which more diversity of opinion has been entertained than that which relates to the extent to which the incision in the prostate gland should be carried. This contrariety of opinion, however, exists in a much less degree now than it did formerly. Modern lithotomists seem to be pretty well agreed that the division should always be as limited as it can be consistently with the safe and easy extraction of the foreign body. In my own operations I have strictly adhered to this rule, and have never had any occasion to regret it, but quite the reverse. The wound should in no instance, however bulky the stone may be, extend entirely through the lateral lobe of the prostate, on account of the danger of urinary infiltration from division of the vesical reflection of the pelvic fascia. When the concretion is very voluminous, it should either be broken, and extracted piecemeal, or, what is better, the opening should be enlarged by incising the opposite half of the gland. If this do not afford sufficient room, the only resource is to crush the calculus, or to remove it by the suprapubic or rectal section. In ordinary cases, where the foreign body is of moderate dimensions, I incise the organ to a very limited extent, and immediately after enlarge the opening with the finger, the pressure of which is generally sufficient for the purpose. When it is not, the probe-pointed bistoury is used as a substitute. It is remarkable how lacerable the organ is in children and adolescents, and to what extent it may be torn, without endangering the parts by infiltration. In old subjects, especially such as have labored for a long time under induration and enlargement of the gland, the division is generally obliged to be effected with the bistoury.

In childhood and early boyhood, or up to the twelfth year, the division of the entire gland is absolutely essential to the introduction of the finger and the forceps into the bladder, and the extraction of the calculus. I am confident that this has happened

in all my operations, sixty-six in number, and I have yet to meet with a solitary instance in which the procedure was followed by infiltration of urine. The annexed drawings, figs. 74, 75, and 76, copied from personal dissections, exhibit the size and shape of the prostate at birth and at four and twelve years.

Fig. 74.



Fig. 75.



Fig. 76.



Fig. 74. Prostate at birth. Width, at base, 4 lines; a little above middle, 5 lines; at apex, 2 lines; length along the middle, 4 lines, and at the edge, $4\frac{1}{2}$; thickness at base, 2 lines; at middle, $3\frac{1}{2}$; and at apex, $1\frac{1}{2}$. Weight, 13 grains.

Fig. 75. Prostate at 4 years. Breadth at base, 6 lines; just above the middle, 7; and at the apex, $2\frac{1}{2}$; length along the middle, 6 lines; and 7 lines at the margin; thickness at base, $2\frac{1}{2}$ lines; at the middle, 4; and at apex, 2. Weight, 23 grains.

Fig. 76. Prostate at 12 years. Width, $8\frac{1}{2}$ lines, at base; $9\frac{1}{2}$ above the middle, and 3 at apex; length along the middle, 8 lines, and $8\frac{1}{2}$ at the edge; thickness at base, 3; middle, $4\frac{1}{2}$, and at apex, $2\frac{1}{2}$. Weight, 43 grains.

Lithotomy in impubic subjects is generally one of the simplest and easiest of surgical procedures. My practice now invariably is to make a small external incision, and, after opening the membranous urethra and the apex of the prostate, to divide the remainder of the gland and neck of the bladder with the finger. This can always be done with the greatest facility, while the pelvic fascia, being indisposed to tear, offers a mechanical obstruction to the finger, whereby the dangers of cellulitis and urinary infiltration are reduced to a minimum. To prevent the knife from passing between the bladder and the rectum, the index finger should be kept in close contact with the upper angle of the wound, just below the arch of the pubes, while the handle of the knife should be depressed towards the lower angle of the wound, through which manœuvre its point is well raised and kept in the groove of the staff, otherwise the instrument may pierce the prostate, and even the base of the bladder, and the finger form a cavity in the loose connective tissue of the rectovesical space, and thus lead to the idea that the bladder has been penetrated, when, in reality, it has not been opened at all. The staff should not be withdrawn until the surgeon is assured that

the finger is fully in the organ, or, if possible, in contact with the stone.

7. *Extent of the External Incision.*—Quite different is it with regard to the outer wound in the adult. While the internal should always be small, the external can scarcely be too large, or too free and dependent. The extent of the outer wound should never be less, in the adult, than three inches to three inches and a half; in very young subjects it must, of course, be proportionately limited, but even in them it should rarely be less than two inches. There is no little risk of urinary infiltration where the external wound is small and elevated; for it serves to retain the water, as in a sort of reservoir, and enables it to fret and irritate the deep portions of the wound, before they have received a glazing of plastic matter. The rule, then, in regard to this subject is briefly and simply this, a small internal incision, and a free external one.

Difficulties of Extraction.—Difficulty frequently occurs in the extraction of the stone. This may depend, first, upon the stone itself; secondly, upon the bladder; and thirdly, upon the pelvis.

1st. The difficulty may be caused by the lodgment of the stone in the *bas-fond* of the bladder, which, in old subjects affected with enlargement of the prostate gland, is often converted into a sort of *cul-de-sac*. A concretion, especially when of inconsiderable volume, may be so deeply buried here as to elude every attempt, on the part of the surgeon, to seize it. The remedy is to raise the stone up, and place it within reach of the instrument, with the left index-finger inserted into the rectum.

The stone is sometimes lodged above the pubes, from which it may refuse to descend to the inferior part of the organ. When this is the case, an attempt should be made to displace it by compressing the hypogastrium, after thorough relaxation of the abdominal muscles. Should this fail, a strong probe, bent into a hook, may be used, or it may be drawn down with the point of the index-finger.

2d. The stone may be entangled in the folds of the mucous membrane; or it may be spasmodically grasped by the bladder, which may thus prevent the blades of the forceps from being expanded over it. In the former case, the scoop replaces the

forceps; or, if this fail, dislodgment may be attempted by throwing cold water into the bladder, in a full stream, from a large syringe. In the latter case, the surgeon desists for a few minutes, until the organ relaxes its convulsive grasp, when the foreign body is seized and extracted. Should the spasm be severe and refuse so yield, it may be overcome by anæsthetics.

3d. It sometimes happens that the stone is encysted or partly encysted, and partly free. When this is the case, the finger should be introduced into the bladder and the cyst ruptured with the nail, or a probe-pointed bistoury, or a knife fashioned like a gum lancet, and furnished with a long handle. A similar procedure may be employed when the calculus has been rendered adherent by a mass of organized lymph; or when it is embedded in the wall of the bladder, impacted in the orifice of the ureter, or lodged in the body of the prostate gland. Embarrassment may be occasioned by the presence of a urinary pouch between the bladder and the rectum, as happened to Mr. Hancock, of London. The bladder itself was much contracted, and contained the calculus, which the instrument had thus been prevented from reaching.¹

4th. It may be difficult to seize the stone on account of the great depth of the perineum, attended, perhaps, with an extraordinary length of the bladder. Such an occurrence is rare in children, but not infrequent in old and stout subjects. The remedy consists in making firm pressure upon the bladder just above the pubes, by which the stone is forced down into the lower part of the viscus.

5th. The stone, under the grasp of the forceps, may break into numerous fragments, be reduced to a soft, pulpy mass, or be crushed into small sandy particles. If the fragments are large, they may be extracted with the forceps; if small, with the scoop and syringe, with which the cavity of the bladder should be thoroughly washed out by throwing into it copious and repeated streams of tepid water.

6th. Delay and inconvenience may arise from the presence of a considerable number of calculi. When the stones are multiple, they should be extracted one after another, either with the forceps, or with the forceps and scoop. The repeated introduc-

¹ B. B. Cooper's Lectures on Surgery, p. 488. Philadelphia, 1852.

tion of these instruments, if properly conducted, is rarely productive of much inconvenience ; on the contrary, it is astonishing how well, in general, the operation is borne. It is only when the bladder or the neighboring parts are severely irritated, bruised, or lacerated, that serious mischief is to be apprehended.

7th. Extraction may be rendered difficult by the fracture of the asperities of the calculus. Of this I had a remarkable instance in a gentleman whom I cut some years ago. The stone was covered with long spines, a number of which broke off under the pressure of the forceps, which, in consequence, I was obliged to reintroduce at least six or eight times, before I was able to maintain my hold with sufficient force to effect extraction.

8th. Embarrassment and delay may proceed from the manner in which the stone is grasped. It is hardly necessary to state that the concretion should always, if possible, be seized by the forceps by its smallest diameter ; but the reverse may happen, and then the extraction will, of course, be rendered proportionately difficult. When the surgeon has reason to believe that the calculus has been seized by its longest diameter, the finger should be at once introduced into the wound to ascertain the fact, and be prepared, if need be, to assist in changing the position of the foreign body. Before this can be done, however, the forceps must relax their hold upon the calculus, but it is not necessary to withdraw them from the bladder. For want of attention to this point, great injury is sometimes done to the neck of the bladder, as well as great delay experienced in removing the concretion.

9th. Embarrassment occasionally results from an inability to find the concretion after the bladder has been opened. This may depend upon some of the causes already detailed ; or it may be owing to the expulsion of the stone, especially if it be of small volume, at the moment of completing the section of the neck of the bladder and the prostate gland. The urine in such a case may drive the calculus before it, which may thus escape without the knowledge of the operator, and be lost in the pool of blood and water, in the folds of the blanket or upon the floor. Such an accident might not only subject the patient to needless suffering, from long-continued and fruitless attempts to find

the concretion, but also seriously compromise the character of the surgeon.

10th. The greatest embarrassment which the lithotomist has to encounter in the extraction of the stone arises from its bulk. It may be stated, as a general rule, that when the concretion weighs three to four ounces, it will pass the wound with considerable difficulty, and the impediment will be much augmented if it weighs six or eight ounces. It is true, a much larger calculus has sometimes been removed successfully; but, in most cases of this description, the patient has had either a very narrow escape, and suffered a long time, perhaps permanently, from the injury sustained by the bladder, or the bladder and the perineum, in the extraction of the foreign body, or dies from exhaustion during the operation, or a short time after from the effects of inflammation.

When the calculus is of unusual magnitude, the extraction is to be accomplished either by simply enlarging the wound, if this has not been already done, to the utmost permissible limits, or by incising the right lobe of the prostate to the same extent as the left; or, finally, by breaking the concretion, and removing it piecemeal. Enlargement of the wound is effected with the probe-pointed bistoury, carried downwards and outwards in the direction of the original incisions, while the stone is held firmly with the forceps. The perineum being thus rendered protuberant, the resisting parts are put upon the stretch, and consequently yield more readily before the knife. The right lobe of the prostate is divided in the same manner, and in the same direction as the left. These two methods may almost always be resorted to with a reasonable prospect of success, when the weight of the stone does not exceed three or four ounces. When the concretion is very bulky, crushing, with the forceps represented in fig. 77, will generally be necessary.

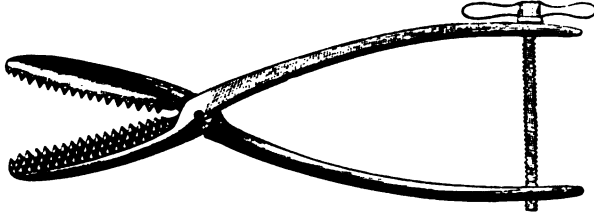
With the view of obtaining more room for extracting large stones, Sir William Fergusson¹ practises an external semilunar incision of the superficial structures with the ordinary lateral section of the prostate, and Mr. Henry Lee² carries an incision through the posterior half of the median line of the perineum

¹ London Lancet, vol. i., 1868, p. 1.

² Medical Press and Circular, Nov. 18, 1868.

to two or three lines in front of the anus, from which point it is extended for a quarter of a circle around the front and left side of the rectum, the operation being completed as in the lateral method. The object of these procedures is to provide a free

Fig. 77.



Crushing Forceps.

external opening for the more easy extraction of the concretion ; but as they do not provide for a larger opening at the points where the difficulty is encountered, I cannot see that they possess any advantages. On the contrary, they retard recovery from the great length of time required for the closure of the superficial incisions.

11th. Embarrassment of a serious, if not an insurmountable, character may arise from unusual narrowness of the outlet of the pelvis, from some congenital or acquired deformity. In rickety subjects, the opening is sometimes reduced to a mere vertical slit. In such a case, the perineal operation of lithotomy would, of course, be inadmissible.

12th. In exceptional instances, circumstances may arise which prevent the surgeon from operating on the left side of the perineum, and rendering it necessary to cut on the right side. Thus, the late Professor Pope, of St. Louis, was obliged to resort to this course on account of a vicious position of the thigh, caused by ankylosis of the hip-joint ; and Zeiss had to pursue a similar course in consequence of the left side of the perineum being occupied by a congenitally displaced testicle.

Lastly. The calculus occasionally coexists with calcareous incrustation of the surface of the bladder. Such a complication will necessarily occasion delay, if not positive embarrassment in the operation. The proper procedure is, first, to extract the calculus in the usual manner, and then to remove the calcareous

matter with the forceps, scoop, and finger, aided with the syringe.

Accidents attending Lateral Lithotomy.—The accidents that are most liable to occur during and after the lateral operation, are hemorrhage, sinking, retention of urine, pelvic cellulitis, infiltration of urine, phlebitis, cystitis, lesion of the prostate gland, peritonitis, pyemia, tetanus, explosion of preëxisting disease, wound and sloughing of the rectum, incontinence of urine, impotence and sterility, perineal fistule, and orchitis.

a. Hemorrhage.—One of the most serious accidents attending lithotomy is hemorrhage. This, which may be either arterial or venous, may take place at the time of the operation, before the completion, perhaps, of the incisions, or after the incisions have been made, but before the stone is extracted; or it may not happen until after the foreign body has been removed, and the patient put to bed; in fact, not until after the expiration of several hours or even days. In the former case, the hemorrhage is said to be primary; in the latter, secondary. The quantity of blood lost may be small, or so copious as to induce severe and even fatal exhaustion.

The principal sources of the hemorrhage in this operation are the artery of the bulb and the superficial artery of the perineum. In old subjects, a copious flow of blood occasionally proceeds from the prostatic plexus of veins. The pudic artery, in its normal course, can hardly be wounded posteriorly, from the manner in which it is protected by the tuberosity and ramus of the ischium; as it extends forwards, however, into the anterior part of the perineum, it becomes more exposed, especially where it lies between the layers of the triangular ligament, and is, therefore, in danger of being injured. This accident is most liable to happen when the prostate is divided with the gorget, the lithotome caché, or the beaked knife. When the pudic artery arises directly from the internal iliac, and passes forwards over the side of the prostate, on its way towards the penis, it is hardly possible for it to escape, no matter how the operation is performed.

The artery of the bulb is one of the largest branches of the pudic, and is apt, when divided, to bleed profusely. From its deep position, and the readiness with which it retracts, it is always secured with difficulty. It is best avoided by entering

the knife, in the second step of the operation, not higher than twelve or thirteen lines in front of the anus, as the vessel lies fourteen lines above this point. If the incision is made lower down in the perineum, there is danger of cutting into the groove of the staff through the prostate gland instead of the membranous portion of the urethra; a circumstance which would lead to much difficulty in extracting the stone. When the artery arises lower down than natural, its division is almost inevitable.

A tremendous gush of blood sometimes proceeds from the transverse perineal artery, which is occasionally enormously enlarged, even in very young subjects, probably in consequence of the long-continued irritation kept up by the stone in the bladder. The bleeding, in this case, generally follows the first incision, and should be immediately arrested by the ligature.

The superficial perineal artery is rarely cut; when it is, the bleeding is generally so trifling as not to require any particular notice on the part of the operator. It is only when the vessel is uncommonly large, or when it retracts within the opening of the fascia through which it emerges, that it is likely to become a source of trouble. In either case, the hemorrhage may be so profuse as to induce the belief that it proceeds from a wound of the pudic artery.

The inferior hemorrhoidal artery, the posterior branch of the pudic, is generally of small size, and is in no danger of being injured, except when it is given off unusually high up, and passes almost across the ischio-rectal space without dividing. Should such an anomaly exist, the hemorrhage might be quite free, though it would be easily enough arrested, unless the vessel is cut so close to its origin as to retract within the surrounding tissues, or its coats are so diseased as to be incapable of supporting a ligature.

A considerable hemorrhage occasionally proceeds from the vesical veins, or the arteries and veins of the prostate gland. In old persons, especially in such as have labored long under stone in the bladder, stricture of the urethra, perineal fistule, irritation of the rectum, or disease of the prostate, these vessels are exceedingly prone to varicose enlargement, forming a close plexus, which is habitually distended with black blood. The connective tissue in which this plexus is imbedded, is, under such circumstances, also much changed in its character, being not only

increased in quantity, but likewise considerably indurated. Hence, when these vessels are divided they are unable to retract, or bury themselves among the surrounding parts, and the hemorrhage, which is often very profuse, the blood welling out simultaneously from a great number of points, can only be arrested, by protracted compression, aided by cold applications.

On the whole, it is exceedingly probable that, in very many cases, if not in a majority, in which the hemorrhage is at all copious, it proceeds from an anomalous arrangement of the perineal arteries, which it is beyond the power of the surgeon to avoid.

Much difficulty is often experienced in ascertaining whence the blood issues. When the transverse perineal artery is divided, its source is usually sufficiently obvious, from the superficial situation of the vessel; but when the pudic artery, or the artery of the bulb, is cut, it is no easy matter frequently to decide this important question. Nothing, in such a case, short of the most thorough examination can enable us to detect the bleeding orifice. This examination should be conducted with the fingers, assisted by a sponge mop, and a small pair of fenestrated forceps, for separating the deep portion of the wound.

The seat of the hemorrhage will often enable us to determine its source. Thus, when it proceeds from the artery of the bulb, the blood issues from the upper angle of the wound; from the lower angle, when it is furnished by the hemorrhoidal; and from the external part of the wound, when it comes from the pudic, or superficial perineal. When the hemorrhage is seated very deeply, the probability is that it proceeds from the vesical plexus, from some of the vessels of the prostate gland, or from an irregular distribution of the pudic. When the hemorrhage arises from the injury, division, or laceration of a papillary tumor of the bladder, its source will usually be sufficiently indicated by the difficulty or peculiarity attending the operation, and by the absence of hemorrhage from the perineal vessels.

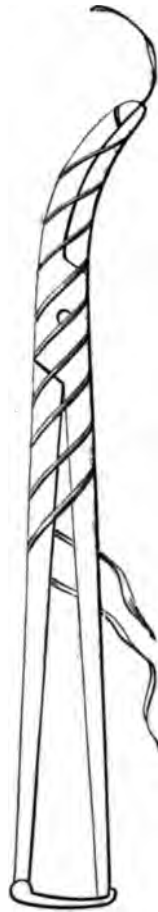
Serious, if not fatal, bleeding may arise from the hemorrhagic diathesis. The blood, in this variety of hemorrhage, generally proceeds from numerous points, oozing from the divided parts as from the pores of a sponge. Should a patient, affected with this diathesis, be cut for stone, he would probably bleed to death; for no care which the surgeon could employ after the operation

would be likely to save him. It should, therefore, always be the duty of every one to inquire into this circumstance before he ventures upon the use of the knife.

However the hemorrhage may be induced, or from whatever source it may originate, it is to be borne in mind that the blood may escape only partially, or perhaps not at all, at the wound, but that it passes inwards into the bladder, where it is either retained, or expelled from time to time in thick clots. The organ, under these circumstances, will form a hard, solid tumor, which is more or less tender on pressure, and which may mount as high up as the umbilicus. The expulsion of the clots is attended with violent spasm and tenesmus, bearing a close resemblance to labor pains.

To arrest the hemorrhage, in all cases where the artery is within reach, the ligature should be employed in preference to any other expedient. The vessel should be seized with the forceps, tenaculum, or needle, and secured in the usual manner. When the artery of the bulb is cut, it may be drawn forwards by means of a pair of very slender polypus forceps, which answer the purpose much better than the common instrument, or the tenaculum, which permits the blood to escape by its sides, so as to obscure the bleeding orifice, and interfere with the application of the ligature. The pudic artery, owing to its deep situation, is best secured with Physick's forceps, represented in the annexed drawing, fig. 78. It is an admirable instrument, and should find a place in every lithotomy case.

Fig. 78.



Physick's Forceps.

Fig. 79.



Cannula for Plugging the Wound in Lithotomy.

Compression, which may be resorted to in all cases where it is impossible to use the ligature, may be made with the finger, a tampon, a canula, or a pair of forceps. The former of these methods was much employed by Pouteau, who sometimes maintained the pressure for hours together, by a relay of assistants. The practice might be useful in some cases, as when the other means fail, but it is too inconvenient and fatiguing, both to the patient and the surgeon, to be resorted to on slight occasions.

A more eligible mode of making compression is by means of a canula, surrounded with a chemise. The canula, represented in fig. 79, and consisting of silver, or gum-elastic, three inches and a half long, by four lines in diameter, open at the vesical extremity, and provided with two large eyes, is inserted into the bladder, previously emptied of clots, when the chemise is tightly plugged with charpie or cotton. The instrument is then secured by means of pieces of tape to a double-T bandage, and answers the twofold purpose of conducting off the urine, and compressing the bleeding vessels. It should be retained for four or five days, or until there is reason to believe that all danger of hemorrhage

Fig. 80.

Arterial
Compressor.

is over. When no canula is at hand, and the case is urgent, a female catheter, a piece of reed, or the spout of a tin coffee-pot, may be used as a substitute. This mode of compression is particularly applicable when the bleeding proceeds from the prostatic plexus of veins, or when the blood oozes from numerous points.

The compression may be effected, in the third place, with a common tent, or a tampon of sponge, charpie, or soft linen; but, in this case, it is necessary to keep a catheter in the urethra for carrying off the urine. In this variety of compression, as well as in the preceding, the deep portion of the wound must be plugged first, dossil being piled upon dossil until the whole is filled up. A soft compress is then applied to the perineum, and the whole confined by a T bandage. In obstinate cases of deep-seated venous hemorrhage, the compresses may be saturated with styptic solutions, or a sponge wet with a saturated solution of Monsel's salt will be found useful, as I know from personal experience.

Lastly, when the bleeding vessel is situated very far back, it may be grasped by the delicate, slender forceps, represented in fig. 80, which I devised many years ago, the blades being permanently retained, by unscrewing its handle, until all danger from hemorrhage is over.

Although I have spoken here of compression by plugging the wound, and pointed out the circumstances in which it is applicable, I must confess I have no partiality for it. On the contrary, I should always resort to it with reluctance, inasmuch as it is not only attended with more or less pain, but is liable to lead to undue inflammation both of the perineum and the bladder, and may even be productive of serious consequences. There are cases, however, in which it is unavoidable, and in which no judicious practitioner would hesitate to employ it.

Cold applications, in the form of irrigations, may be used, in many cases, with benefit. Made directly to the wound, the perineum, or the rectum, they have a tendency to induce contraction of the bleeding vessels, to allay pain, and prevent inflammatory action. The water should be directed upon the part, in a continuous but gentle stream, from a fountain syringe, and the pelvis should be so situated as to enable it to run into a tub at the side of the bed. A piece of oil-cloth, placed under the nates, will more effectually secure this object. The operation may, if necessary, be kept up several hours without risk of injury. It may be aided by cold applications to the hypogastric region, groins, and inside of the thighs; by strict recumbency; by cooling, acidulated drinks; and by full doses of opium, which should never be omitted, as they constitute an important part in the treatment of all traumatic hemorrhages. When the bleeding depends upon the hemorrhagic diathesis, our chief reliance must be upon opium and acetate of lead, opium and alum, opium and gallic acid, or ergotine, with ice and some one of these salts to the wounded parts.

The period, after the operation, at which secondary hemorrhage sets in, varies from a few minutes to several hours or days. If it does not come on within the first ten or twelve hours, the probability will be strong that it will not show itself at all. In general, it will make its appearance as soon as reaction is established, or the patient has recovered from the shock of the operation. The means already pointed out must be put in force; the

coagulated blood must be removed with the fingers, scoop, or syringe; the bleeding vessel must be exposed and tied; or, if the ligature is inadmissible, compression or irrigation must be resorted to, and steadily maintained until all danger is past.

β. Sinking.—Few patients, at the present day, perish from the shock of the operation of lithotomy. It is, however, easy to conceive that very alarming, if not fatal, results may ensue when the operation is unusually protracted, when great violence is used in extracting the stone, accompanied with severe contusion or laceration of the bladder and perineum, or when there has been a considerable loss of blood. Under such circumstances, the shock may be so great that the patient may die upon the table, soon after he is put to bed, or, at all events, during the first twenty-four hours, without, perhaps, any attempt at reaction. In former times, death was occasionally produced by excessive pain, operating upon a nervous and debilitated constitution; but since the introduction of chloroform and other anæsthetic agents, no such accident has occurred. Persons sometimes perish from sheer fright at the very idea of a severe operation. It is related of Desault that he one day lost a patient, about to be lithotomized, in this way. The man, who was very cowardly, fainted, and died, under the impression that the operation was progressing, when the illustrious surgeon was, in fact, only tracing the line of the intended incision upon the perineum with his finger.

The treatment must be stimulating, with recumbency and free access of air. When reaction begins, the patient must be carefully watched, lest over-excitement take place, followed by excessive nervous and vascular action.

γ. Retention of Urine.—This may be caused by inordinate tumefaction of the wound and spasm of the urethra; or, as more frequently happens, by the closure of these passages by coagulated blood. In the former case, relief is afforded by the catheter; in the latter, by clearing away the blood with the finger or scoop, and preventing further hemorrhage.

δ. Pelvic Cellulitis.—An acute, rapidly spreading inflammation of the perivesical and periprostatic connective and vascular tissues, known as pelvic cellulitis, is a fruitful source of death in adults. It occurs generally in persons of unsound health, and is occasioned by urinary infiltration, by the violence sustained by

the deep parts during the extraction of the calculus, by constitutional predisposition, or by the extension of erysipelas from the outer wound. Cellulitis usually supervenes within the first forty-eight hours, and is liable to lead to extensive suppuration, the formation of abscesses, peritonitis, or septicemia. It is ushered in by rigors and high constitutional disturbance, and is rapidly followed by great prostration and typhoid symptoms. The local pathological appearances are those met with in urinary infiltration, and the treatment is conducted upon the same general principles as for that affection.

.. Urinary Infiltration.—One of the most infrequent, although one of the most dangerous effects of lithotomy, is an escape of urine into the connective tissue of the perineum, or of the perineum and the parts immediately around the neck of the bladder. Its occurrence is favored by too free a division of the prostate gland; by the small size of the wound, or by its being too conical; by the early and inordinate tumefaction of the cut surfaces; and, above all, by the perforation of the reflected portion of the pelvic fascia. The attack usually comes on within a short time after the operation, and is apt to run its course with frightful rapidity. A sense of weight, heat, and smarting at the neck of the bladder, and pain in the hypogastric region behind the pubes, attended with symptoms of excessive constitutional irritation, denote the commencement of the disease. The skin is hot and dry, the pulse weak and frequent, the tongue parched and brown, the wound glazed and fetid, and the urine scanty and high colored. The prostration rapidly increases, the surface becomes covered with a cold, clammy sweat, hiccup sets in, the abdomen grows tympanitic, and the patient dies completely exhausted, usually in three or four days from the invasion of the malady. On dissection, the surfaces of the wound, the infiltrated parts, the neck of the bladder, and even the prostate gland, are all found in a highly inflamed, offensive, and sloughy condition. The pelvic portion of the peritoneum is frequently red, injected, and incrustated with lymph.

Little can be done to arrest the progress of this affection when once established. Depletion by the lancet, and by purgatives, is wholly inadmissible. The system must be sustained by carbonate of ammonia, quinine, iron, camphor, and capsicum, in combination with the liberal use of brandy and opium. Ano-

dynes are indispensable from the very beginning. The best topical means are saturnine and opium fomentations, medicated cataplasms, injections of a weak solution of nitric acid or chlorinated soda, and touching the whole track of the wound as early as possible with nitrate of silver or the tincture of iodine. When the infiltration is caused by the small size, ill shape, or improper direction of the wound, the defect must be remedied by the knife, to afford a free outlet for the urine. Hot fomentations may be applied to the hypogastric region.

ζ. Phlebitis.—This affection occasionally occurs after this operation. It is most frequently met with in elderly subjects, affected with an unusual development of the veins of the neck of the bladder and the prostate gland. The disease usually arises within the first four or five days, and soon spreads through the neighboring connective tissue, assuming a diffused erysipelatous character, and terminating, if the patient survive sufficiently long, in purulent infiltration. The treatment, although antiphlogistic, is conducted cautiously, and with due regard to the constitution. Cold or warm applications are used as may be most grateful to the part and the system; iodine is applied to the surface around the wound, especially in the erysipelatous form of the inflammation, and the utmost attention is paid to cleanliness. If gangrene supervene, the wound must be syringed with weak solutions of nitric acid, tincture of myrrh, chlorinate of soda, or chloral, for the purpose both of correcting fetor, and instituting a more healthful action. The constitutional treatment must be directed upon general principles.

The phlebitis, consequent upon this operation, occasionally invades the extremities, producing symptoms very similar to those which accompany phlegmasia dolens. When this is the case, the proper local remedies will be leeches, fomentations, iodine, and blisters, followed by free incisions to afford vent to effused and pent-up fluids. The system must be supported by anodynes and stimulants, especially opium, quinine, and brandy, administered in full and sustained doses. Venesection is generally inadmissible, if not decidedly prejudicial, and the use of mercury, except in so far as it tends to correct the secretions, should be dispensed with. After the violence of the inflammation has subsided, the limb should be carefully bandaged, and

as soon as the patient is able to move about, he should take gentle exercise in the open air.

7. Cystitis.—Slight inflammation of the mucous membrane of the bladder is one of the most common complications of this operation, supervening within the first few days, and showing itself by a frequent desire to urinate, with more or less spasm, a sense of weight, and bearing-down pains. The most suitable remedies are hot fomentations to the hypogastrium and perineum, diluent drinks, and full doses of morphia. When the inflammation is urgent, and tends to extend to the associated organs, venesection may be required.

8. Lesion of the Prostate Gland.—This gland may be seriously injured in the operation, either by the knife, the finger, the forceps, or the calculus. When the perineum is of unusual depth, it may be difficult, especially for an inexperienced operator, to make a smooth section of the organ; perhaps the knife slips out of the groove of the staff, and, in attempting to reinsert it, it may be thrust in at a different point. Thus the part may be nicked, as it were, and the consequence will be that the wound will be multiple instead of being simple, as it always ought to be. Again, harm may be done with the finger, in attempting to enlarge the wound of the prostate after slight incision has been practised. In general, however, there is little danger from this course. The most serious mischief is usually inflicted by the forceps, the blades of which, instead of being expanded over the stone, embrace a portion of the gland, and either bruise it severely, or tear it away from the body. The part of the organ most liable to suffer in this way is the enlarged middle lobe, as it lies behind the neck of the bladder in the form of a narrow ridge, or nipple-shaped prominence. The error can generally be readily detected by the peculiar feel of the tumor, which is soft and compressible, while the calculus is hard and unyielding. Where doubt exists, the instrument should be carried up into the cavity of the bladder after seizure has been effected, or the finger may be placed in contact with the body as it lies within the grasp of the forceps. In the former case, the instrument will refuse to ascend if it has hold of the prostate gland, and in the latter the discrimination is easily determined by the sense of touch.

When the third lobe is in the way of the stone, it should be

depressed with the finger; or, what is better, the *bas-fond* of the bladder should be elevated through the rectum; an expedient which will bring the stone on a level with the jaws of the instrument, and enable the operator to seize it with great facility.

On making the section of the prostate, it sometimes happens that a myomatous fibroma is accidentally enucleated from its bed, and brought away in the grasp of the forceps in advance of the calculus. I have met with this occurrence on several occasions, and in none was life endangered, although in all the closure of the wound was greatly retarded. In a case of this description,¹ occurring in an elderly subject, post-mortem inspection, three years and a half subsequently, disclosed that the cavity left by the removal of the growth had progressively enlarged, until a large pouch had formed, which had increased the difficulty in voiding urine, which was a prominent symptom during life.

When the prostate has been much contused, or lacerated, whether unavoidably, or through inadvertence, the best practice is to cut away the injured part with a pair of long, curved, blunt-pointed scissors, such as surgeons are in the habit of using for excising the uvula. The wound is thus converted into a simple one, which does not slough, but heals by the granulating process.

Where the stone is very large, the prostate may suffer excessive contusion during its extraction, followed by violent inflammation and even sloughing. In such a case, which is fortunately of rare occurrence, our chief reliance must obviously be upon the employment of antiphlogistic remedies, particularly leeches and ice to the perineum, in the early stage of the treatment, and, afterwards, upon fomentations and poultices.

A very disagreeable effect, but fortunately a very rare one, of the irregular division of the prostate gland, is the formation of a little flap, tongue, or pedicle, which, after the healing of the wound, may fall, like a valve, against the orifice of the urethra, and thus seriously impede the flow of urine. The part, in fact, produces very much the same trouble as hypertrophy of the middle lobe of this organ, described in another portion of the work.

¹ Trans. of the Path. Soc. of Phila., vol. iv. p. 153.

If the existence of such a body could, in any way, be determined during life, the proper remedy would be crushing, or strangulation by means of a silver wire, carried into the bladder by a large catheter. Or, these expedients failing, relief might be attempted by lateral cystotomy.

ι. Peritonitis.—Peritonitis seldom follows the operation of lithotomy, whether performed at the perineum or above the pubes. It is, however, more frequent in the latter than in the former, because the peritoneum is more liable to be wounded, and because there is also more danger of urinary infiltration. In the perineal operation, it is exceedingly rare that the serous membrane of the pelvis is injured by the knife, but great mischief is occasionally done to the bladder and the surrounding parts by rude and long-continued attempts at extracting the foreign body. From this cause, Sir Henry Thompson states that the affection is more common in children than in adults, and that, in them, it constitutes the chief source of death. My own experience does not confirm these assertions, since I have met with peritonitis only in a single instance, after the lateral operation, in 140 cases, and the subject was an adult. The tables of Dr. Garden, however, sustain the statement of Sir Henry Thompson. Thus, it was the cause of death in 108 out of a total of 824 cases operated on at the Sarahunpore Dispensary, 52 per cent. having occurred in children, and 21.66 per cent. in adults between the thirtieth and seventy-eighth year.

The treatment must be prompt and vigorous. Blood should be taken from the arm, or, where the lancet is inadmissible, by leeches from the hypogastrium. The entire belly should be kept constantly covered with hot anodyne fomentations, renewed with great care; the system is kept fully under the influence of opium; and the heart's action is reduced with aconite and other depressants.

κ. Pyemia.—Pyemia is most liable to occur in broken-down persons, from violence inflicted during the extraction of the calculus. It is probably of more frequent occurrence than is generally supposed, 4 out of 186 cases of lithotomy analyzed by Mr. Smith, of Leeds, having succumbed to it. I have myself met with it only once, the patient being a boy, three years old, in whom the wound had nearly healed.

The disease usually sets in with violent rigors, accompanied

by great elevation of the temperature of the body, and followed by copious sweats and rapid prostration, and death within the first week. The treatment is most unsatisfactory, our main reliance being upon milk punch, large doses of quinine, and anodynes.

λ. Tetanus.—Death after this operation has been known, in some instances, to be caused by tetanus. Of such an event, which must be very rare, especially in temperate climates and in healthy subjects, I have no personal knowledge. Should an attack be threatened, it must be promptly met with full doses of anodynes and antispasmodics, and, if the subject be much debilitated, by a liberal allowance of quinine and alcoholic stimulants. When much suffering is present, chloroform, or nitrite of amyl, will be found to be valuable adjuvants in controlling muscular action.

μ. Explosion of Preëxisting Disease and Ischuria.—Stone, as is well known, frequently coexists with other diseases, which, as long as the bladder is affected, often remain in a state of latency; or, at all events, make but little progress towards a fatal termination. As soon, however, as the vesical irritation is removed, they frequently acquire new intensity, and proceed with great vigor in the work of disorganization. This is particularly true of the kidneys, which are not infrequently in an advanced state of disease, as granular contraction, or suppuration. Under these circumstances, death may ensue within forty-eight hours, the fatal issue being preceded by rigors, copious sweats, intense thirst, vomiting, pain in the loins, great prostration, ischuria, delirium, and coma. The same is true of organic disease of the ureters, the prostate gland, and the bladder itself, but not to the same degree. Hence, as elsewhere stated, the rule with nearly all lithotomists is never to meddle with any case in which there is reason to believe that there is serious involvement of any portion of the urinary apparatus. Unfortunately, however, we cannot always make a proper application of this rule, on account of the difficulty of forming a correct diagnosis.

The treatment of suppression of urine, which is nearly always promptly fatal from uremic poisoning, consists in dry cupping and stimulating liniments to the loins, and the exhibition of diuretics with quinine and strychnia.

A few examples have occurred in which death has been caused by apoplexy, after this operation. The event is most liable to happen in elderly corpulent subjects, who, having long suffered from stone in the bladder, have led an indolent life, and have, perhaps, been affected with ossification of the cerebral arteries. One of my own patients, a man upwards of seventy years of age, died from apoplexy of the brain six weeks after the operation, from the effects of which he had, apparently, entirely recovered.

•. Wound of the Rectum.—This accident may happen in any of the three stages of lithotomy; but it is not likely to occur, if the bowel be depressed over towards the right side with the left index-finger, as the knife divides the deeper seated structures of the perineum and the membranous portion of the urethra. It is only by neglecting this precaution, or omitting to lateralize the knife sufficiently in this stage of the proceeding, that the rectum is likely to suffer. If the accident do occur, the opening will commonly be found to be small, and to be situated immediately in front of the neck of the bladder. There will be an interchange between the parts of urine and feces, the quantity of which varies in different cases, and the discharge of which may continue for an indefinite period. In general, however, it soon begins to diminish, and ceases altogether in fifteen or twenty days, or, at furthest, in a month. In children, the opening sometimes closes completely in less than a week; sometimes, indeed, by the first intention:

An accident of this kind is in general more disagreeable than dangerous. Unless the wound is very large, and the patient in dilapidated health, nature, assisted by art, is almost always competent to effect a cure. The treatment consists in preventing the bowels from acting, except every third or fourth day, by means of anodynes, in washing out the rectum frequently with cold water, in permitting none but the most bland and simple food, in the constant retention of a soft catheter, in touching the opening every third or fourth day with a weak solution of per-nitrate of mercury, or solid nitrate of silver, and in enjoining a strict observance of the recumbent posture. The suggestion of Pouteau, Desault, and others, to divide the parts that lie between the external orifice of the wound and the opening into the gut, cannot, I think, be too much deprecated. If the practice be at all justifiable, under any circumstances, it is only when the track

has become fistulous or remained in this state sufficiently long to induce the conviction that it cannot be cured, either by the efforts of nature, or the means just pointed out. When the operation is unavoidable, it should be conducted upon the same principles as in anal fistule.

‡. Sloughing of the Rectum.—Another accident which occasionally follows the operation of lithotomy is sloughing of the rectum. It is most liable to take place in broken-down subjects, whose health has been much deteriorated by previous suffering, or who have the misfortune to be cut during the prevalence of erysipelas, or within the walls of crowded and ill-ventilated hospitals. The immediate cause of the occurrence is probably slight infiltration of urine in consequence of the great and unnecessary depth of the wound, or injury done to the recto-vesical septum during the extraction of the calculus.

The effect of such an accident, leaving out of the question the inflammatory symptoms, is similar to that of a rectal fistule, caused by the knife, only that the opening of communication between the bladder and the rectum will be likely to be much larger, and, consequently, more tardy in healing. No definite rules can be laid down respecting the treatment, which must evidently be regulated by the circumstances of each individual case. In general, it will be necessary to support the strength by a carefully regulated diet, and by tonics, especially quinine, wine, and brandy. The secretions must be properly attended to, and the parts must be kept clean by the frequent injection of weak solutions of soda, or the nitric acid lotion, which will, at the same time, tend to arrest the gangrene, and establish healthy action.

°. Incontinence of Urine.—Incontinence of urine, consequent upon perineal lithotomy, is happily infrequent; but it is more common in impubic than adult subjects. It is not always easy to determine how this accident is produced. It usually arises from injury inflicted upon the neck of the bladder during the extraction of a large or very rough calculus, by which the parts are overstretched, bruised, or lacerated. The loss of power of the sphincter muscle may be partial or complete. In most instances, the power of retaining the fluid is greater in the recumbent than in the erect or semierect posture, because less pressure is exerted by it upon the neck of the bladder in the former case than in the latter. The affection is usually accompanied by a

sense of uneasiness, soreness, or burning at the lower part of the pelvis, or at the commencement of the urethra.

When there is a probability that incontinence of urine will take place, every effort should be made to prevent it. The patient should be strictly confined to his bed, a warm bath should be administered once a day, for twenty-five or thirty minutes at a time, cold water should be frequently thrown into the rectum, and free use should be made of demulcent fluids. When the affection is fully established, it will be necessary, in addition to these means, to leech the perineum occasionally, and to apply gentle but steady pressure upon that part with the pad of a T-truss, or an instrument constructed upon the same principles as that which is sometimes worn for compressing the anus in prolapse of the rectum. In obstinate cases, cauterization of the neck of the bladder and the commencement of the urethra may be tried with some prospect of success. Internally, the patient may use the tincture of the chloride of iron, strychnia, cantharides, and alkalies.

κ. Impotence and Sterility.—These occurrences, like incontinence of urine, are very rare after lateral lithotomy. As the operation is usually performed, the prostate gland is divided externally to the seminal ducts, which consequently remain intact. But even when they are accidentally wounded, it is doubtful whether any ill effects will result. When impotence follows the operation, it is almost always caused by violence done to the seminal ducts or their orifices during the extraction of the stone, terminating in inflammation and, perhaps, in slight gangrene. The two effects are not always combined, as a man may be able to copulate but not procreate. There is no remedy for its relief. Sometimes the patient is rendered impotent in consequence of the semen being nearly all discharged through a urethro-rectal fistule instead of the natural passage.

ρ. Perineal Fistule.—The wound made in lithotomy generally heals in from three to four weeks; but sometimes it remains open much longer, and occasionally it does not close at all, but degenerates into a fistule. This may be owing to injury done to the bladder at the time of the operation; or it may be caused, more remotely, by ulceration or sloughing. In some instances, it is dependent upon the lodgment of sabulous matter, the impaction of a fragment of stone, or the constant intromission of thick, ropy

mucus. Most of the water flows through the natural channel; only a small quantity escapes by the fistule. Sometimes the perineal opening is reduced down to the size of a thin bristle, and so continues for many years, now and then shedding a few drops of urine. The abnormal track, as all similar passages in other parts of the body, becomes gradually lined by an adventitious mucous membrane. The existence of the fistule is determined by the appearance of the urine at the external opening, and by an examination with a probe.

The treatment consists in drawing off the urine at stated intervals, and in cauterizing, every sixth or eighth day, the neck of the bladder with nitrate of silver. The patient should be confined to his back, with the nates resting continually higher than the other parts of the body, in order that the urine may be prevented from coming in contact with the inner orifice of the fistule. When the track is unusually small, and the perineum uncommonly thin, relief may sometimes be afforded by the occasional introduction of a heated wire, or the galvanic cautery, or a probe incrustated with nitrate of silver. In obstinate cases, when the ordinary remedies have proved unavailing, the parts should be divided with the knife, as in the first instance, although much less extensively. All foreign substances, obstructing the artificial route, must of course be removed as early as possible.

α. Orchitis.—Inflammation of the testicle is an occasional result of lateral lithotomy, and is doubtless due to injury inflicted upon the ejaculatory ducts during the extraction of the calculus. It rarely appears before the end of the second week, and is to be met by the measures ordinarily resorted to for this affection from other causes.

After-treatment.—As soon as the stone has been extracted, and the bleeding arrested, the patient is untied, cleansed, and carried to his bed, which should always be properly arranged before the operation. It should be provided with slats, and a cotton, moss, or hair mattress, covered with a sheet, over which is spread a large piece of soft oil-cloth, to protect the bedding from urine and blood. Another sheet called the draw-sheet, folded several times, and arranged so as to make the middle of it correspond with the buttocks, is placed over the oil-cloth, and serves to ward off pressure, as well as to receive the secretions

as they flow from the wound. The head and shoulders should be slightly elevated by a pillow.

My experience is that it matters little, if any, what posture the patient assumes after he has been put to bed. I usually, however, request him to lie on his right side for the first five or six hours, to afford the lips of the wound an opportunity of becoming glazed with lymph before he is obliged to urinate. At the end of this period, and, indeed, often much earlier, I permit him to rest upon his back, or upon either side, as may be most agreeable to him. Young subjects, unless they are incessantly watched, will seldom remain in the same posture beyond a few minutes, and I must confess I have yet to see a case in which any detriment resulted from this source.

It is equally unnecessary, in my judgment, to tie the patient's knees together after the operation is over, and he has been put to bed; or to introduce a tube into the bladder by the wound, to conduct off the urine, with a view, as it is alleged, of preventing infiltration of the surrounding connective tissue. This expedient can never be required except in those cases in which the incisions are unusually extensive.

The urine sometimes begins to flow by the wound in a few minutes after the operation; but, in general, little, if any, passes for the first four or five hours. It then usually comes away in a gush, attended frequently with severe pain and spasm of the neck of the bladder. By the end of the first day, the edges of the wound are generally so much swollen that the urine ceases to flow through the perineum, and takes the course of the urethra. This, however, rarely continues beyond twenty-four or thirty-six hours, when the tumefaction has usually so far subsided as to allow the fluid to resume its original course. The period at which the urine begins to pass off permanently by the urethra varies from ten to fourteen days. Occasionally, however, I have known it to happen as early as the eighth day and as late as the twentieth. The change in the direction of the fluid is always attended with more or less pain at the neck of the bladder, and a scalding, smarting, or burning sensation in the urethra and head of the penis.

The treatment after the operation must be strictly antiphlogistic. The patient is kept quietly in bed, and all excitement, both bodily and mental, is sedulously guarded against. The

pain consequent upon the operation is often extremely severe, and should be promptly met by a full dose of morphia, administered hypodermically.

Demulcent drinks should be used freely throughout the treatment, especially during the first few days. They not only allay thirst, but, what is of great importance, they dilute the urine, and diminish its acrid qualities, thus rendering it more acceptable both to the bladder and the wound. They may consist of elm-bark water, flaxseed tea, or gum Arabic water, and they may be simple, or combined with nitrate of potassa, bicarbonate of soda, or dilute nitric acid, according to the particular indication of the case.

The diet must be light, unirritant, and of the most simple kind. For the first few days, the patient should take little else than panada, thin gruel, weak chicken broth, or bread and milk. After that he may use rice, toast and tea, crackers, or a small quantity of mush and milk. No meat or vegetables should be permitted under five or six days, unless the patient is infirm or there is marked evidence of debility.

In all cases, I make it a rule to prevent any action of the bowels for the first three days. At the end of this time, I generally order a dose of castor oil or Rochelle salt, assisted, if the purgative is tardy in its action, by an enema of tepid soapsuds. The same, or other means may be resorted to afterwards to keep the bowels in a soluble condition. If, during the progress of the case, the patient's tongue becomes coated, and his appetite impaired; or if his general health suffers; or if he does not improve as well and as rapidly as he ought; or, finally, if the urinary secretion is loaded with mucous and earthy matter, the best remedy he can use is a dose of calomel, which often, in these circumstances, acts like a charm in promoting recovery.

The draw-sheet is frequently renewed, and every possible attention paid to cleanliness. Sometimes the patient's comfort is greatly promoted by a soft sponge, or an old napkin, placed beneath the perineum, and arranged so as not to compress and obstruct the wound. The urine is thus imbibed as fast as it flows off, and the consequence is a less frequent necessity for a change of bed and body clothes. Excoriations of the nates and neighboring parts must be prevented by frequent ablutions, and the application of benzoated zinc ointment; and the scrotum

must be kept out of the way of the wound by a suspensory bandage.

During the progress of recovery, it sometimes happens that the edges of the wound become incrustated with phosphatic matter, forming a thin, whitish layer, which adheres quite firmly to their surface. The occurrence is not productive of pain; but, as it prevents the formation of healthy granulations, it serves to retard the reunion of the parts, and should, therefore, be promptly attended to. The best remedy is the nitric acid lotion, in the proportion of about four drops to the ounce of water, applied by means of a folded cloth. When the incrustation extends far back, the fluid may be injected once or twice daily into the bladder. In most cases, the local application should be aided by the internal exhibition of the remedy.

When the wound is tardy in healing, or has contracted to a mere orifice, a catheter ought to be permanently retained in the bladder, to conduct off the urine through the natural channel. The walls of the urethra being then equally distended, and the sides of the wound compressed, a cure sometimes follows in a few days.

The wound made in this operation occasionally unites by the first intention; but such an event, desirable as it certainly is, is rarely to be looked for, and I have never had a solitary example among my own cases. Professor Dudley,¹ of Lexington, witnessed primary union eight times in one hundred and thirty-five cases; and Mr. Crichton,² of Dundee, Scotland, had union by the first intention in twenty-three out of two hundred cases operated on by him; a result which, so far as I know, is without a parallel.

Statistics.—Of 2303 cases of lateral lithotomy in the hands of American surgeons, 156, or about 1 in 14 $\frac{1}{4}$, died. Dudley lost 1 in 34 $\frac{1}{2}$, or 6 in 207 cases; Mott, 1 in 23, or 7 in 162 cases; Mettauer, 1 in 22 $\frac{1}{4}$, or 4 in 91; Kissam, 1 in 21 $\frac{1}{4}$, or 3 in 65; Goldsmith, 1 in 19 $\frac{1}{4}$, or 3 in 58 cases; and N. R. Smith, 1 in 15, or 3 in 45. My own practice, embracing 140 cases, shows 12 deaths, or 1 in 11 $\frac{3}{4}$. Of 66 impubic subjects all, except one, recovered, while of 74 operations in adolescents, adults, and

¹ Transylvania Journal of Medicine and the Associate Sciences, vol. ix. p. 288, 1836.

² British and Foreign Med.-Chir. Review, July, 1854, p. 158, Amer. ed.

old persons, 11, or 1 in every 6½, died. In foreign practice the results are not so favorable. Thus, of 2711 operations in the hands of Cheselden, Martineau, Liston, B. B. Cooper, Southam, Teale, Fergusson, Keith, Norgate, Crichton, Grant, Cutcliffe, Curran, Brett, Raddock, Pouteau, Vericel, Kern, Zett, Wattmann, Balassa, and Pollak, 278, or 1 in 9½, were fatal. Martineau, whose success has always been considered amongst the most brilliant and extraordinary in surgery, lost 1 in 42, or 2 in 84 cases; and Pouteau, 1 in 40, or 8 in 120 cases. From the combined experience of American and European operators, the mortality of lateral lithotomy in private and public practice may be placed at 1 in 12.92. The results of lateral lithotomy in hospital practice alone, are, however, not so encouraging, as is shown in the subjoined table:—

Table showing the Results of 5149 Cases of Lateral Lithotomy in Different Hospitals.

Locality.	Number.	Cures.	Deaths.	Proportion.
Pennsylvania Hospital	105	87	18	1 in 5.83
Luneville Hospital	365	332	33	1 in 11
Hôtel-Dieu, Paris	89	30	9	1 in 4.33
La Charité, Paris	34	19	15	1 in 2.26
Hôpital des Enfants, Paris	60	51	9	1 in 6.66
St. Mary's, Moscow	411	369	42	1 in 9.78
Loretto Hospital, Naples	553	471	82	1 in 6.74
Hospital at Canton	147	131	16	1 in 9.18
Norfolk and Norwich Hospital	871	755	116	1 in 7.50
Bristol Infirmary	354	275	79	1 in 4.48
Leeds Infirmary	197	169	28	1 in 7.08
Addenbrooke's Hosp., Cambridge	183	170	13	1 in 14.07
Radcliffe Infirmary, Oxford	110	96	14	1 in 7.85
Leicester Infirmary	90	82	8	1 in 11.25
Birmingham General Hospital	102	92	10	1 in 10.2
Guy's Hospital, London	230	197	33	1 in 6.96
St. Thomas's Hospital, London	200	171	29	1 in 6.89
University College Hosp., London	90	78	12	1 in 7.50
Glasgow Infirmary	100	86	14	1 in 7.14
Futtehghur Dispensary, India	84	84	0	0 in 84
Saharanpur Dispensary, India	824	716	108	1 in 7.63
	5149	4461	688	1 in 7.48

The results of the lateral section are, as was before stated, materially affected by the age of the patient. It is generally supposed that children recover most readily from the effects of the operation, and the opinion, although not without exceptions, is, in the main, well founded. The subjoined tables are adduced

in illustration of the subject. The first affords an account of Mr. Cheselden's cases, and is the more interesting and valuable, as it exhibits, in bold relief, the fruits of the first trials of the lateral method, as practised at the present day.

Table of Cheselden's Operations.

Age	Cases.	Cures.	Deaths.	Proportion.
From 1 to 10	105	102	3	1 in 35
" 10 to 20	62	58	4	1 in 15.5
" 20 to 30	12	9	3	1 in 4
" 30 to 40	10	8	2	1 in 5
" 40 to 50	10	8	2	1 in 5
" 50 to 60	7	3	4	1 in 1.75
" 60 to 70	5	4	1	1 in 5
" 70 to 80	2	1	1	1 in 2
Total	213	193 ¹	20	1 in 10.65

Table of 704 Cases at the Norfolk and Norwich Hospital.

Age.	Cases.	Cures.	Deaths.	Proportion.
From 1 to 10	281	262	19	1 in 14.79
" 11 to 20	106	97	9	1 in 11.77
" 21 to 30	48	43	5	1 in 9.6
" 31 to 40	48	45	3	1 in 16
" 41 to 50	47	37	10	1 in 4.7
" 51 to 60	96	71	25	1 in 3.84
" 61 to 70	70	50	20	1 in 3.5
" 71 to 80	8	6	2	1 in 4
Total	704	611	93	1 in 7.37

Table of 824 Cases at the Saharunpore Dispensary.²

Age.	Cases.	Cures.	Deaths.	Proportion.
From 1 to 10	294	272	22	1 in 13.86
" 10 to 20	123	108	15	1 in 8.2
" 20 to 30	150	136	14	1 in 10.7
" 30 to 40	102	79	23	1 in 4.4
" 40 to 50	81	68	13	1 in 6.2
" 50 to 60	55	42	13	1 in 4.2
" 60 to 70	16	10	6	1 in 2.6
" 70 to 80	3	1	2	1 in 1.5
Total	824	716	108	1 in 7.6

¹ The calculi in three of these cases weighed, respectively, eight, ten, and twelve ounces. The greatest number of concretions in any one of the patients was thirty-three.—Cheselden's Anatomy, p 333. Boston, 1806.

² Dr. Garden, Indian Annals, No. xxiii., 1868.

The influence of age upon the result is well shown by 1827 cases, of which 229 died, derived from British hospital practice, and tabulated by Sir Henry Thompson. The mortality from 1 to 11 years was 1 in $17\frac{1}{3}$; from 12 to 16, 1 in $9\frac{1}{2}$; from 17 to 29, 1 in $7\frac{1}{3}$; from 30 to 48, 1 in $7\frac{1}{3}$; from 49 to 70, 1 in $4\frac{1}{3}$; and from 71 to 81, 1 in $3\frac{1}{3}$.

Of 60 children cut by M. Guersant, at the Hôpital des Enfants, Paris, 9 died, being in the ratio of 1 to $6\frac{2}{3}$. On the other hand, of 56 children operated on at St. Thomas's Hospital, London, only one perished; and I myself have lost only 1 in 66 cases. Three-fourths of the patients lithotomized by Dr. Dudley—207 in number—were under 15 years of age. Of Mr. Martineau's 84 cases, 26 were from 1 to 10 years, 13 from 10 to 20, 9 from 20 to 30, 7 from 30 to 40, 4 from 40 to 50, and 25 from 50 to 80. The loss of the American lithotomist was 1 in $34\frac{1}{2}$; of the English, 1 in 42.

The size of the calculus also exercises an important influence upon the results of the operation of lithotomy, not only when performed according to the lateral method, but every other. The subjoined table, compiled from those of Mr. Crosse and Dr. Garden, gives the weight of the calculus, and the mortality, in 1327 cases operated on at the Norwich Hospital and the Saharunpore Dispensary.

Table showing the Mortality of the Lateral Operation, as influenced by the Size of the Calculus.

Weight in ounces.	Cases.	Cures.	Deaths.	Proportion.
1 ounce and under	969	881	88	1 in 11.01
1 to 2 ounces	249	211	38	1 in 6.55
2 to 3 "	68	43	25	1 in 2.72
3 to 4 "	21	9	12	1 in 1.75
4 to 5 "	11	5	6	1 in 1.83
5 to 6 "	7	5	2	1 in 3.5
6 to 7 "	2		2	
	1327	1154	173	1 in 7.67

The average size of the calculi in Dr. Dudley's cases, as I am informed by Dr. Bush, was less than that of a pullet's egg, the weight of the largest being 9 ounces, and its circumference $11\frac{1}{2}$ inches. The smallest concretion in Martineau's cases weighed

only a few grains ; the largest, $5\frac{1}{2}$ ounces ; the majority not exceeding 2 drachms.

The circumstances which tend to influence the results of the lateral—as, indeed, of every other operation of lithotomy—are exceedingly numerous and diversified in their character ; and are worthy of profound consideration. The most important of these circumstances are referable, first, to the skill of the surgeon ; secondly, to the manner of preparing the patient's system ; thirdly, to the age and health of the patient ; fourthly, to the nature and volume of the concretion, and its situation in the bladder ; and, lastly, to the selection of our cases. Children are, all other things being equal, better subjects for the operation than adolescents, adults, and aged persons ; a large or an encysted calculus will be more likely to produce mischief, during its extraction, than one that is small, or free ; and a sickly individual, or one whose constitution has been impaired by protracted disease, will run more risk than a healthy one. Then, again, a great deal apparently depends upon sheer luck. Thus, an operator will occasionally have the good fortune to cut twenty or thirty cases in succession, without, perhaps, losing a single one, and he is disposed to congratulate himself upon his infallibility ; all at once, however, the tables are turned against him, and the next two or three patients slip through his hands, and that, too, perhaps, without any appreciable cause. His good luck has forsaken him, and, by the time he reaches his fiftieth case, he has the mortification to see that his victories, like those of a skilful general, have not been achieved without a certain number of victims.

The preparation of the system must also exert some influence upon the result of the operation. How far this should, as a general rule, be carried, is a point which cannot be easily determined. The subject is one upon which different surgeons will entertain different opinions. I am, myself, always in favor of a certain amount of preparation ; but I do not think that it should, in ordinary cases, be carried very far ; for the very fact of its employment is often sufficient to inspire the patient with great dread in regard to his ultimate fate. He takes it for granted that an operation which requires so much preliminary attention, must necessarily be one of great danger ; and the apprehension thus engendered is well calculated, especially if he be at all timid,

to unfit him for the approaching ordeal. Mr. Brett, of Calcutta, who cut 108 persons, with a loss of only 7, is inclined to think that his success was chiefly due to the fact that he always operated without any preparatory treatment, aided by the influence of the mild and salubrious climate of the country, and the simple habits of the natives. Mr. Liston, who lost 16 patients out of 115, or about 1 in $7\frac{1}{2}$, also placed very little reliance upon any measure of this kind; whereas Dr. Dudley, who lost 1 in $34\frac{1}{2}$, always considered it as of paramount importance. Mr. Martineau always kept his patients a week in the house before they were operated on; he regulated their diet most carefully, but gave them very little medicine. His loss in 84 cases was only 2, or in the ratio of 1 to 42. It is to be lamented that we have no satisfactory statistics upon a subject which every one must regard as of so much consequence.

There can be no doubt that many patients are lost after the operation, even although this may have been executed in the most dexterous and faultless manner, from the want of proper care on the part of the surgeon, or from the imprudence and intractableness of the patients themselves. Children and young persons generally will require very little after-treatment; but elderly subjects always demand the greatest vigilance. The proper rule, however, is to attend to all alike until all danger from the effects of the operation shall have passed over.

What influence, if any, season exerts upon the results of this operation is unknown. The only statistics, I believe, upon this subject, are those supplied by Mr. Crosse, and these are on so limited a scale as to entitle them to but little weight. Of 100 fatal cases of the lateral section, reported by this writer, 6 occurred in January, 3 in February, 11 in March, 11 in April, 9 in May, 9 in June, 5 in July, 6 in August, 9 in September, 9 in October, 13 in November, and 9 in December.

Relapse.—When it is considered that most vesical concretions have their origin in the kidneys, or, at all events, that these organs are often contemporaneously affected, it is not surprising that the disease should occasionally return after operation. What number of cases relapse after being lithotomized, is a point for the determination of which we have no positive or reliable data. The probability is that the proportion varies not only in

private and public practice, but in different institutions and different countries. At the Norfolk and Norwich Hospital there were, according to Mr. C. Williams,¹ only 27 cases of relapse after 1015 operations, or 1 in 37.58. At the Luneville Hospital, France, the register shows 13 cases of relapse after 1492 operations, or 1 in 116. At La Charité, Paris, 70 persons were cut for stone from 1806 to 1831, and in 6 of these, or 1 in 11, the operation was performed a second time. Of 824 lateral lithotomies at the Saharunpore Dispensary,² only 6, or 1 in 137, were cut a second time. At the Hospital of Incurables, Naples, there were 10 relapses in 401 cases.³ In Bavaria, according to the returns received by Civiale, the proportion of relapses is as 1 to 32; in Bohemia, as 1 to 46; in Dalmatia, as 1 to 53; and in Romania, as 1 to 16. From the general table, drawn up by this distinguished author and operator, it would seem that the number of persons affected a second time with stone in the bladder after lithotomy, is very small; for, out of 4446 cases, only 42 relapsed, that is, 1 in 105.⁴

I have referred to the above statistics, not on account of any intrinsic value which they possess, but because they serve to show what little reliance is to be placed upon such data. If we take the Norwich tables of Mr. Williams we shall see that only 27 persons out of 1015 suffered from relapse after having been lithotomized. Now, who will believe that this is a true representation of the facts of the case? Mr. Williams states that these individuals were cut a second or third time, but he does not inform us how many others experienced a return of the disease without having submitted to a second operation. It is perfectly obvious that the history of many of the patients must have been lost, for it may be reasonably inferred that comparatively few revisited the institution in which they had been treated; and, on the other hand, it may be concluded, that many of those who experienced a relapse either declined further interference altogether, or that, if they sought advice, they went to other operators. Thus, if these premises be correct, it follows,

¹ Holmes's System of Surgery, 2d ed., vol. iv. p. 1008.

² Dr. Garden, op. cit., p. 56.

³ Schmidt's Jahrb., 1834. Bd. 4, p. 215.

⁴ Traité de l'Affecton Calculeuse, p. 695. Paris, 1838.

as a natural consequence, that it was utterly impossible to ascertain the number of relapses in the cases to which they relate. The table, therefore, like every similar production hitherto published, is of little practical utility, inasmuch as it is deficient in its details, and, therefore, only a very remote approximation to the truth.

Relapse after operation is no doubt greatly influenced by the nature of the calculous diathesis. There are, unfortunately, no statistics by which the question can be decided; but it is, I think, safe to affirm, that persons affected with phosphatic calculi are more prone to suffer a second and even a third time than those affected with lithic concretions, or concretions composed of urate of ammonia or oxalate of lime. Organic disease of the kidneys and ureters, the bladder, prostate gland, and urethra, may be mentioned as a predisposing cause of relapse. Derangement of the digestive organs, especially if protracted, and attended with much flatulence and acidity, exercises a similar influence. Indeed, whatever has a tendency to disorder the general health, and depress the vital powers, will be likely to promote the occurrence of the malady, and should, therefore, receive the closest scrutiny, and the promptest attention. Injury of the spine, as from a fall, blow, or kick, especially if followed by paraplegia, will, unless very speedily relieved, be almost sure to be succeeded by relapse.

The period at which the relapse occurs must, of course, depend upon circumstances, the nature of which it is frequently impossible even to conjecture, much less to explain. Occasionally it is very short; and, on the other hand, a number of months, and even years, may intervene, the general health, meanwhile, being perhaps little, if at all, impaired. As a general rule, it may be assumed that the phosphatic and ammoniaco-magnesian calculi are more rapidly reproduced than the lithic and oxalic. But to this exceptions occasionally occur. Thus, in an instance communicated to me by Dr. J. Dixon, of Alleghany, a man, aged sixty-nine, from whom he removed two large calculi of this kind, experienced a return of his vesical symptoms at the end of three months. He had labored under gravel from an early period, and made a very rapid recovery. A second operation was performed a year after the first, and five similar calculi—two as large as the previous ones—were extracted. He again

made a rapid recovery, and has remained free from urinary disease ever since, now a period of three years.

In two of my own cases, the interval between the operation and the recurrence of the disease was very short; in one it did not exceed four weeks. When this happens, the vesical affection is always, as a general rule, complicated with renal disorder, resulting in the formation of concretions, which gradually descend into the bladder, where their presence is speedily followed by a reproduction of the previous symptoms. This circumstance was strikingly evinced in the instance of Alexander, from whom I extracted two calculi, with only very temporary relief, and whose kidneys, in less than a year after the operation, were literally filled with calculous matter; at the same time that the bladder contained eleven distinct concretions, from the volume of a millet seed to that of a small filbert. In such a case, there evidently exists a calculous diathesis, which no treatment, whatever may be its character, can correct or arrest. It is worthy of notice that the new stone, especially when rapidly formed, is usually very soft and fragile, breaking under the gentlest pressure of the forceps.

The case is quite different when the relapse is occasioned by an imperfect clearance of the bladder. The accident, fortunately infrequent, has happened to good operators, and is not always avoidable, especially when there are several concretions, of which one is extremely small; or when there is only one, and a spicule or fragment breaks off, and hides itself, as it were, between the folds of, or in the *bas-fond* of the bladder. Injection of the viscus with a large syringe and a full stream of water is the best guarantee against this contingency. Should recurrence of the symptoms take place, no time must be lost in ascertaining the real condition of the bladder. If the concretion is small, extrusion is promoted by dilatation of the urethra; if this fail, lithotomy is again employed, and now, if possible, with greater care, to insure future immunity.

The best mode of determining the existence of fragments in the bladder after the cicatrization of the wound in lithotomy, is, undoubtedly, the introduction of the sound. The instrument is, of course, used in the same manner as under ordinary circumstances, but great care should be taken that the organ do not contain too much water, otherwise it will not be likely to hit

the concretion, or, hitting it, to elicit anything like a satisfactory sound. It is well-known that, owing to the retention of fragments, relapse is much more common after lithotrity than after lithotomy.

Repetition of the Operation.—It has been already stated that the operation of lithotomy may, from various causes, require to be repeated, not only once, but perhaps a number of times; and not only so, but, perhaps, in pretty rapid succession. Thus, a case occurred to Dupuytren in which he cut twice in three days. Sir Astley Cooper operated three times in one case, and his nephew, Mr. Bransby Cooper, also upon another individual, within the space of four years. Dr. Van Buren informs me that Dr. Mott has, on three occasions, operated a second time on the same patient, and that one of the cases had a fatal issue. Dr. Dudley, out of two hundred and seven cases, has had but one, that of a colored boy twelve years of age, in which he performed a second operation.¹ The late Dr. Nathan Smith,² of New Haven, who had altogether twenty-three cases, was obliged to cut one of his patients three times. There are at least fourteen cases on record in which the patient was cut four times, and four cases in which five operations were performed.³

But the most remarkable instance of this kind upon record is that reported by Mons. Clever de Maldigny, a military surgeon, at a meeting of the French Institute, in May, 1827.⁴ In a paper on lithotomy, read before that learned body, he stated that he had been the subject of stone not less than seven times, and that he had six times undergone the lateral operation, namely, at the age of six, eight, eighteen, twenty, twenty-two, and twenty-four years. The sixth time, the stone was situated at the neck of the bladder, and the patient cut himself, a glass being placed between his legs, to enable him to direct the bistoury in the course of the cicatrice of the previous incisions. The calculus was extracted with the fingers. In his seventh attack, he had recourse to lithotrity, which was successfully per-

¹ Dr. Bush, MS. letter to the author.

² *Medical and Surgical Memoirs*, edited by N. R. Smith, M.D., p. 244. Baltimore, 1831.

³ Dr. Piersig. *Beiträge zur Chir. Path. der Handwerkzeuge*. von Dr. Bruno Schmidt. Leipzig, 1865, p. 45.

⁴ *Revue Médicale*, June, 1827; *London Lancet*, vol. xii. p. 556.

formed at four sittings, by Dr. Civiale. Subsequently, Clever was operated upon for stone the eighth time.¹

When the perineum has been repeatedly cut for the removal of stone from the bladder, the resulting cicatrice is apt to become preternaturally dense, and to offer more resistance to the knife than the healthy tissues. The part occasionally remains tender for a long time, and in some instances it has been known to be the seat of neuralgic pain. A second operation has often permanently cured a small but intractable fistule left by the first.

ART. II.—BILATERAL LITHOTOMY.

The merit of devising this operation is usually ascribed to Celsus, though it more probably belongs to Le Dran. Its advantages have been prominently set forth in modern times by Chaussier, Bécларd, and Dupuytren, the latter of whom performed it successfully in 1824, and who may be said to have regularized and perfected it. In this operation, the perineum and the prostate gland are divided on both sides, with less risk, it is asserted, than in the ordinary method, of wounding the pelvic fascia and the surrounding plexus of veins. It is contended, moreover, by the advocates of this plan, first, that it is better adapted to the removal of large calculi; secondly, that it is applicable to all ages and to both sexes; thirdly, that it is singularly easy of execution; and, fourthly, that it secures the rectum, the bulb, the perineal arteries, and the seminal ducts, from liability to injury. That some of these advantages are exaggerated is sufficiently evident. Thus, as it respects hemorrhage, it is perfectly certain that several patients have perished from it. It is also certain that it is not easier of execution than the lateral section, which is often performed in an almost incredibly short time; nor is it any better adapted to persons of different ages. If it possess any advantages at all over the ordinary method, it must be on the ground that it affords a larger opening for the passage of the foreign body, and that it is attended with less danger to the rectum and the seminal ducts. But even of these the former is, in great degree, counterbalanced by the modern method of

¹ Lond. Med. and Surg. Journ., New Series, vol. v. p. 264.

dividing the right lobe of the prostate, if the wound in the left be found insufficient for the extraction of the calculus. In reality, then, the bilateral section has but one advantage over the lateral, namely, the greater immunity which it affords to the bowel and the seminal ducts.

The bilateral operation requires the same preliminary measures as the other method. The patient is placed in the same position, the limbs and the staff are held in the same manner, and the surgeon occupies the same situation. The incisions through the

Fig. 81.



Double Lithotome
Caché.

perineum as far as the groove of the staff, are executed with an ordinary scalpel, and the prostate is divided with a double lithotome caché, represented in fig. 81, a narrow knife, or a probe-pointed bistoury, according to the whim, fancy, or caprice of the lithotomist.

A staff with a central groove having been introduced into the bladder, a semilunar incision is carried across the perineum, beginning on the right side midway between the tuberosity of the ischium and the margin of the anus, but a little

Fig. 82.



Bilateral Lithotomy.

nearer the former than the latter, and terminating at the corresponding point of the opposite side, when it assumes the form

seen in fig. 82. The concavity of the cut is directed downwards, and its centre, situated at the raphé of the perineum, is about nine lines above the anus. In this direction are divided successively the skin, the connective tissue, and the superficial fascia, together with a few of the anterior fibres of the external sphincter muscle. The end of the left forefinger is now placed in the bottom of the wound, just as in the ordinary procedure, the staff sought, and the membranous portion of the urethra laid open to the extent of four lines. The nail of the finger is then applied to the staff, to serve as a guide to the lithotome, the beak of which is next inserted into the groove of the instrument, with its concavity looking upwards. Taking care, by moving the lithotome several times forwards and backwards, that it is securely lodged in the groove, the surgeon seizes the handle of the staff, and depresses it nearly to a level with the abdomen, at the same time that he lowers the lithotome, and pushes it onward into the bladder. As soon as the instrument has reached the bladder, its point is disengaged from the staff, and brought in contact with the stone, when the staff is immediately removed. The lithotome is then reversed with its concavity towards the rectum, and while it is in this position it is withdrawn, its blades being expanded by pressing on their springs. In this manner, it cuts its way out, slowly and steadily, dividing in its retrograde course the sides of the prostate, in a direction obliquely downwards and outwards, as in the ordinary section. The finger now takes the place of the instrument, the situation of the stone is ascertained, the forceps are introduced, and extraction is effected in the usual manner.

Various modifications of the bilateral operation have been made by different operators, but it is questionable whether they possess any practical value. The first, practised by Civiale from 1829 to the date of his death, combines a median section of the soft parts down to the apex of the prostate, with a bilateral section of the gland in a transverse direction with a straight double lithotome, the extent of this latter incision being less than in Dupuytren's procedure. Sir William Fergusson, in 1843, with a view to furnish a larger external wound, united the ordinary median incision with the crescentic incision above the anus, so

Fig. 83.



that the superficial wound resembled an inverted Y, as shown in fig. 83. Finally, Nélaton¹ performed a prerectal operation, by a transverse incision two inches long, carried across the perineum two-fifths of an inch in front of the anus, or so close to the bowel, in order to avoid the bulb, that it may be viewed as a careful dissection of the rectum from the surrounding parts, the operation being completed with the double lithotome. Of all these so-called improvements, the last is by far the least desirable, as it subjects the patient to longer confinement and the liability to the occurrence of urinary fistule.

The bilateral operation of lithotomy has never had any distinguished advocates in Great Britain, and its principal supporters in this country, at the present day, are Professor Eve, of Nashville, and Professor Hughes, of Keokuk.

Of 429 cases in the hands of American surgeons, 407 recovered, and 22, or 1 in 19.09, died. Of 22 medio-bilateral operations, all were cured. If to these cases are added 85, with 19 deaths, tabulated by Dupuytren, we shall have an aggregate of 536 cases, with 41 deaths, or a loss of 1 in 13.07.

ART. III.—MEDIAN LITHOTOMY.

Median lithotomy consists in cutting through the superficial structures and membranous urethra in the middle line of the perineum, and dilating the prostate and neck of the bladder to an extent sufficient for the easy extraction of the calculus. Originally suggested, in 1808, by Manzoni, of Verona, and subsequently adopted by Rizzoli and De Borsa, lithectasy, as this procedure may be termed, has more recently been warmly advocated by Mr. George Allarton, of England, by Professor Reyer, of Cairo, Egypt, and by Dr. Walter, Dr. Markoe, and Dr. Little, of this country.

As executed by De Borsa, the operation is one of great simplicity. The patient having been placed in the ordinary position, and a staff with a median groove having been hooked up against the subpubic ligament, the whole of the membranous portion of the urethra is opened, so as to expose the staff to the extent of

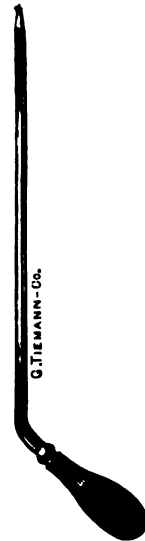
¹ *Elémens de Path. Chir.*, t. v. p. 229.

about ten lines, by an incision carried from without inwards through the median raphé. The left index-finger is then passed into the bladder, along the staff, which is at once withdrawn, and the prostate and neck of the bladder gently and cautiously dilated, with semicircular movements of the finger, to a sufficient extent to admit of the introduction of the forceps and the extraction of the stone.

Instead of cutting from the surface inwards, Mr. Allarton inserts the left index-finger into the rectum, and pressing its tip firmly against the prostate, so as to steady the staff, enters the point of a straight double-edged knife in the middle line, about six lines in front of the anus, and carries it backwards into the groove of the staff for a few lines, so as to divide the apex of the prostate, the opening in the membranous urethra and the superficial structures being enlarged by cutting upwards, as the knife is withdrawn, so that the external wound varies from three-quarters of an inch to an inch and a half in length, in accordance with the presumed size of the concretion. The operation is then completed as in the method of De Borsa, Mr. Allarton having abandoned all dilators except the finger.¹ In children, however, it will be safer to use the director of Dr. Little, of New York, represented in fig. 84, for conducting the finger and forceps into the bladder.

The advantages claimed for this operation over the lateral procedure are, that there is less risk of hemorrhage; that the prostate gland, save a slight notch at its apex, and the seminal ducts are not injured; that there is no danger of infiltration of urine from division of the pelvic fascia; and that the wound closes more rapidly. As an offset to these advantages, it should be stated, that the rectum is in greater danger of being wounded; that the bulb is almost invariably divided; and that, on account of the necessarily limited extent of the incision, and the danger of bruising or lacerating the neck of the bladder and the pros-

Fig. 84.



Little's Director.

¹ A Treatise on Median Lithotomy, London, 1863, p. 123.

tate, the operation is only adapted to small calculi. That this last objection is a most serious one, is shown by the analysis of Mr. C. Williams of 64 cases of median lithotomy at the Norfolk and Norwich Hospital.¹ The entire number of deaths was 13; and in no instance did recovery result when the stone weighed over three drachms and two scruples, except in the case of a man, forty years of age, in which the concretion exceeded four ounces and a half, but it was followed by sloughing of the rectum and perineum, and the establishment of a permanent perineo-recto-vesical fistule. It is proper to add that all the fatal terminations occurred between the fifty-second and sixty-fourth year.

The results of median lithotomy are shown in the following table, from which the cases of Mr. Allarton are excluded, as their accuracy is doubted by English authors.

Table of 350 Cases of Median Lithotomy.

Operators.	Cases.	Recoveries	Deaths.	Proportion.
American surgeons	205	196	9	1 in 23.77
Reyer, of Calro	56	47	9	1 in 6.23
Norfolk and Norwich Hospital .	64	51	13	1 in 4.93
Pemberton, of Birmingham .	25	24	1	1 in 25
Total	350	318	32	1 in 10.93

At least two so-called improvements have been made in the median operation by combining with it the ordinary lateral section of the prostate. Of these, the medio-lateral procedure of Mr. Henry Lee has already been referred to at page 254.

The second modification is that introduced by Professor Buchanan, of Glasgow, in 1847, and consists in making the incisions on a staff bent at a right angle three inches from the end, and deeply grooved on its left side, as represented in fig. 85, with a straight, narrow scalpel, which is fitted to stab as well as to cut. The staff, introduced into the urethra, is moved backwards and forwards on the left index-finger in the rectum until the angle corresponds with the apex of the prostate gland, when the

¹ Holmes's System of Surgery, 2d ed., vol. iv. p. 1078.

handle is depressed towards the abdomen, through which manœuvre the angle is made prominent in the perineum at the verge of the anus. The instrument is now maintained firmly in its position by an assistant, when the operator, with the finger still in the bowel, holds the knife horizontally, with the edge towards the left side, and transfixes the superficial structures, until the point is in the groove of the staff. The knife is then pushed steadily onwards until the bladder is reached, as denoted by the escape of urine, and during its withdrawal, an incision is made downwards and outwards, for nearly three-quarters of an inch, in the direction of the tuberosity of the ischium, and then directly downwards to the same extent.

In this operation, the left lateral lobe of the prostate is divided, while the bulb and rectum are out of danger. In addition to these advantages, Dr. Buchanan claims that it is more easily and rapidly executed than the lateral operation, and that it is attended with less risk of hemorrhage and urinary infiltration. The mortality of the procedure, as given by its originator,¹ is about 1 in 12, six deaths having resulted in upwards of sixty cases.

Fig. 85.



Buchanan's Rectangular Staff.

ART. IV.—RECTO-VESICAL LITHOTOMY.

The recto-vesical operation, devised in 1816, by Sanson, of Paris, and formerly much practised by the Italian surgeons, is now almost obsolete. When first introduced, it was invested with a sort of *éclat*, on account of its supposed advantages, of which not the least striking is its apparent simplicity, and the facility with which it may be executed. It was also imagined that it was entirely free from the risk of hemorrhage, and that, from the dependent character of the wound, it admitted of the more easy extraction of the foreign body. Experience, however,

¹ Medical Times and Gazette, March 31, 1860, p. 311.

showed that it was often succeeded by extensive suppuration of the connective tissue within the pelvis, thus endangering both part and system; that the ejaculatory ducts, and even the seminal vesicles, were occasionally wounded; and lastly, though not least, that it was liable to leave a fistulous communication between the bladder and the rectum. These disadvantages more than counterbalance any benefits which it was supposed to possess by Sanson and his followers. It is not surprising, therefore, that it should soon have fallen into disuse.

Although the recto-vesical section has been discarded, as one of the regular operations of lithotomy, circumstances may arise which may render it not only justifiable but highly proper. Thus, the stone may be lodged in the bas-fond of the bladder, or it may be impacted in one of the ureters, or it may bulge into the rectum, forming a tumor from two to three inches above the verge of the anus, or, finally, it may be too large to extract by the lateral incision.

A staff with a central groove being introduced into the bladder, and confided to an assistant who holds it firmly in the median line, the surgeon inserts his left index-finger, on the palmar surface of which the blade of a straight bistoury rests flatwise, into the rectum for about one inch. He then turns the edge of the knife upwards with his right hand, and pierces the anterior wall of the bowel, so that the groove of the staff is reached just in front of the prostate, when, by withdrawing the knife, he divides the rectum, the anterior fibres of the levator ani, the sphincter, the connective tissue, and the integument in the median raphé, to the extent of one inch. Reëntering the knife, with its point downwards, in the groove of the staff, he pushes it directly onwards in the middle line, dividing the prostate, the neck of the bladder, and the trigone, sufficiently to admit of the removal of the stone.

With a view to prevent the formation of a recto-vesical fistule, Professor Louis Bauer,¹ in 1859, opened the rectum above the prostate, in the trigone, the bowel having previously been expanded with Sims's speculum. The wound was closed with five silver sutures, which were removed on the eighth day, when the union was perfect. Dr. Noyes, in 1860, performed a somewhat

¹ Amer. Med. Gaz., Sept. 1859.

similar operation, closing the wound with metallic sutures, supported by a leaden button.

Table showing the Results of 83 Cases of Recto-Vesical Lithotomy.¹

Operator.	Cases.	Cures.	Fistula.	Deaths.	Proportion.
Vacca	24	19	2	5	1 in 4.8
Giorgi	10	10	1	0	
Cavarra	10	9	1	1	1 in 10
Janson	7	4	0	3	1 in 2.33
Cittadini	5	4	2	1	1 in 5
Dupuytren	4	3	2	1	1 in 4
Moschi	3	3	0	0	
Different operators .	8	5	1	3	1 in 2.66
	9	7	1	2	1 in 4.5
	3	3	1	0	
	83	67	11 ²	16	1 in 5.18

ART. V.—SUPRAPUBIC LITHOTOMY.

In the suprapubic, or high operation, or epicystotomy, as this procedure is variously termed, the bladder is opened above the pubes, in the direction of the linea alba. The proceeding, although objectionable as a general rule, may occasionally be resorted to with advantage, and, therefore, requires brief consideration in this place. The operation, which originated with Pierre Franco, in 1561, was first performed in this country in 1824, by Professor Gibson, of Philadelphia, in the case of an old gentleman of Virginia, who was affected with great enlargement of the prostate gland, and who died soon after from the effects of peritonitis, consequent upon urinary effusion.

Jean de Dot, a blacksmith of Amsterdam, in the 17th century, cut himself in the linea alba, above the pubes, and extracted a stone from his bladder the size of a hen's egg. The stone, the knife, and the portrait of the operator are preserved to this day in the museum at Leyden.

The chief advantages of the high operation are, that it is free from hemorrhage; that it does not expose the patient to injury of the rectum and the ejaculatory ducts; that there is no risk

¹ König: *Journal der Chirurgie von Graefe und Walther*, B. 8, S. 529.

² These cases are added to the cures, or, rather, recoveries, only 56 of which were complete.

from inflammation of the neck of the bladder; that it may be performed where the lateral section is impracticable, on account of impassable stricture of the urethra, excessive depth of the perineum, deformity of the pelvis, or great enlargement of the prostate gland; and, lastly, that it admits of the more easy removal of a large, attached, or encysted calculus. As an offset to these advantages, it is to be remarked that the procedure is liable to be followed by injury of the peritoneum and by urinary infiltration, not to say anything of the difficulty of executing it when the abdomen is loaded with fat, or the bladder does not ascend any distance above the pubes. The latter of these dangers may, however, in general, be avoided by premising a perineal puncture, to serve as an outlet to the urine, which thus drains off as fast as it reaches the neck of the bladder. The former, too, may usually be guarded against, if the precaution be used, first, to distend the bladder thoroughly before the operation, and, secondly, to push the peritoneum gently before the knife after cutting through the inferior part of the linea alba.

In performing the operation, the patient is placed recumbent, upon a narrow table, with the pelvis slightly elevated on a pillow, so as to throw back the intestines, the legs hanging loosely over its lower edge, and the feet resting upon a chair. The head and shoulders are sometimes raised by pillows, to relax the abdominal muscles. Any hair that may cover the suprapubic region is to be removed with the razor or scalpel. The bladder, if not previously distended by the retention of its own contents, is now filled with tepid water until it rises a considerable distance above the pubes. Trifling as this part of the operation apparently is, it cannot be performed with too much care, to prevent the rupture of the organ; an accident which happened occasionally in the hands of the older lithotomists.

These preliminaries being duly attended to, the surgeon, standing on the left side of the patient, makes an incision from three inches to three inches and a half in length, commencing at the pubic symphysis, and extending upwards towards the umbilicus, in the direction of the linea alba. It should pass through the skin and connective tissue down to the aponeurosis of the abdominal muscles. This structure, being thus exposed, is next cautiously divided to the extent of an inch and a half or two inches. Any vessels that may bleed

are now secured; or, what will usually answer equally well, compressed by the finger of an assistant. The bladder will now be found at the bottom of the wound, forming a tolerably large, fluctuating tumor, and invested merely by a thin layer of connective tissue. To divide this, a few gentle touches of the knife are sufficient; or, what is better and more safe, the dissection may be effected with the rounded steel end of the handle of the instrument. Conducted in this manner, there is hardly any possibility of wounding the peritoneum, the great danger in this stage of the operation. If the bladder is quite prominent, it should now be transfixed by a delicate tenaculum; otherwise it should be rendered sufficiently so by the introduction of a sound through the urethra. In either case, it is, I conceive, a matter of paramount importance to secure the bladder before it is incised, in order to prevent it from collapsing, and sinking down behind the symphysis; an occurrence which cannot fail greatly to embarrass the subsequent steps of the operation. An incision is next made into the anterior surface of the viscus, from the level with the pubic symphysis nearly to the neck of the bladder, when the left index-finger, which is at once introduced, is used as a searcher to ascertain the situation and volume of the stone. The opening is afterwards enlarged, with a probe-pointed bistoury, to any extent that may be required; the forceps are introduced; and the stone is seized and removed. The wound in the bladder is now closed accurately by sutures, one end being brought out at the external opening as originally suggested by Professor Bruns,¹ of Tübingen, and the edges of the external incision approximated by several points of the twisted suture, except at the lower angle, where a small opening is left for drainage. Subsequent distention of the bladder may be prevented by the methodical use of the soft catheter.

It has been seen that the chief danger of this operation is injury of the peritoneum. When this is followed by the admission of urine, even in the smallest possible quantity, into the general cavity of the abdomen, violent inflammation is sure to ensue, and to destroy the patient in a few days. Mere lesion of the membrane, without extravasation, is, on the contrary, comparatively harmless.

¹ Deutsche Klinik, No. 15, 1858.

When abscesses form in consequence of an escape of the urine into the connective tissue around the wound, early and free incisions are made, followed by the warm-water dressings. If the matter be allowed to remain pent up, serious mischief must result from its tendency to burrow, and irritate the peritoneum.

In an elaborate paper on suprapubic lithotomy, Dr. C. W. Dulles, of Philadelphia, has collected 465 cases of this operation, of which 330 recovered, and 135, or 1 in 3.44, died.¹ In 19 patients the lateral operation had been previously ineffectually practised for large stones, and not less than 7 recovered. 42 cases, with 14 deaths, occurred in the hands of American surgeons. In estimating the results of epicystotomy, it should be remembered that the operation has generally been resorted to for calculi of much larger size than have been removed by the lateral method. An examination of the following table, framed by Dr. Dulles, will show that, while lateral lithotomy gives far better results for stones weighing less than two ounces, the suprapubic operation is attended by a smaller rate of death when the concretion exceeds two ounces in weight. The figures in the lateral operation are taken from the treatise of Mr. Crosse.

Table showing the Mortality with Calculi of Same Weights.

Weight.	LATERAL OPERATION.				SUPRAPUBIC OPERATION.			
	Recovered.	Died.	Total.	Death ratio.	Recovered.	Died.	Total.	Death ratio.
Under 3j	482	47	529	1 : 11.25	11	3	14	1 : 4.66
3j-ij	101	18	119	1 : 6.61	17	4	21	1 : 5.25
3ij-iiij	19	16	35	1 : 2.18	10	4	14	1 : 3.50
3iiij-iv	4	7	11	1 : 1.57	13	6	19	1 : 3.16
3iv-v	2	3	5	1 : 1.66	9	7	16	1 : 2.28
3v-vj	2	..	2	0 : 2.00	7	4	11	1 : 2.75
3vj-vij	..	2	2	1 : 1.00	1	1	2	1 : 2.00

ART. VI.—EXTRAPELVIC LITHOTOMY.

In the chapter on Cystocele, as well as in other portions of this treatise, mention is made of the fact that urinary calculi are occasionally situated on the outside of the pelvic cavity, being either developed there, or carried thither by the prolapsed bladder. The occurrence, although not frequent, is worthy of par-

¹ Amer. Journ. Med. Sciences, July, 1875, p. 39.

ticular attention, as it involves important principles of treatment. The most common site of the foreign body is the groin, but in some instances the concretion descends into the scrotum, the ischiatic notch, or the pudendum, forming, either by itself, or along with the bowel, a considerable-sized tumor, of a firm consistence, or soft at one point, and hard at another. Occasionally the substance is lodged partly within the pelvis and partly without; and it should be remembered, moreover, that there is sometimes a number of calculi, as in the famous case of Ruysch,¹ in which there were not less than forty-two, and in the still more remarkable one recorded by Mr. Paget,² of Leicester, England, in which a pudendal cystocele contained, in addition to innumerable small concretions, a stone weighing twenty-seven ounces.

The symptoms of this form of calculus do not differ materially from those which attend the ordinary affection. The patient is tormented with pain in the bladder and a frequent desire to pass water, which is often evacuated with great difficulty and only after much straining. Sounding affords little or no light, except of a negative character, or where the calculus is lodged partly in the pelvis, when it may sometimes be touched by the instrument, and thus furnish the usual evidences of the presence of a foreign body. It deserves to be remembered that, where a number of concretions exist, some may lie loose in the body of the bladder, while the rest are lodged in the prolapsed portion of the organ. Such a case, in which two operations were performed before complete riddance was effected, is related in the fourteenth volume of the *Edinburgh Medical and Surgical Journal*, and is of great interest in its practical relations. In general, the stone, when situated externally, can be detected only by the touch: when several concretions are present, a distinct crackling noise may occasionally be elicited by rubbing them against each other.

The proper treatment, in all cases of extrapelvic calculi, is to make an incision through the coats of the prolapsed portion of the bladder, as it lies in its abnormal situation, to extract the foreign body with the fingers, scoop, or forceps, and to retain a

¹ *Obs. Anatom. Chir. Obs.*, i. p. 1, 1691.

² *London Med. and Physical Journal*, vol. vi. p. 391, 1801.

catheter in the organ until the wound is thoroughly cicatrized, lest the parts should suffer from urinary infiltration. Such an operation is not dangerous, because the tumor in its descent does not drag down the peritoneum, and there is, therefore, no proper hernial sac. It is only when the case is complicated with enterocele that there is likely to be a serous investment, although this need not necessarily be divided. When the concretion projects into the pelvis by its larger extremity, the lateral, bilateral, or suprapubic operation may become necessary, as complete rid-dance, under such circumstances, is hardly to be expected by external incision. Several examples have been reported of the spontaneous discharge of vesical calculi from the groin and scrotum. In the case of a shoemaker, recorded by Graefe,¹ a scrotal calculus, of twenty years' standing, and weighing twenty-six ounces, ruptured the scrotum and escaped, during straining at stool.

General Results of the Different Methods of Lithotomy.

The following table presents the general results of the more important operations described in the preceding pages.

Methods.	Cases.	Cures.	Deaths.	Ratio of deaths.
Lateral operation ² . . .	10,150	9036	1114	1 in 9.11
Bilateral operation . . .	536	495	41	1 in 13.07
Median operation . . .	350	318	32	1 in 10.93
Recto-vesical operation . . .	83	67	16	1 in 5.18
Suprapubic operation . . .	465	330	135	1 in 3.44
	11,584	10,246	1338	1 in 8.65

¹ Graefe's und Walther's Journal, vol. iii. p. 399.

² Based upon the statistics of American surgeons, the table at p. 276, and the practice of Cheselden, Liston, B. B. Cooper, Fergusson, Keith, Southam, Crichton, Teale, Balassa, Grant, Curran, Cutcliffe, Raddock, Brett, Pollak, Zett, Pouteau, Vericel, Mormeaux, Petruni, Kern, Chelius, and Wattmann.

CHAPTER X.

STONE IN THE BLADDER OF THE FEMALE.

WOMEN are much less liable to urinary calculi than men, the proportion being about one to twenty, the difference being due, in part at least, to the shortness, width, and dilatability of the female urethra, which thus permit the concretion, in most cases, to pass off immediately after it descends from the kidneys, or after it is formed in the bladder. In the male, on the contrary, the smallest particle of earthy matter is liable to be retained, and to become the nucleus of a stone. The period of life at which they are most subject to stone is from the age of twenty to that of fifty.

The symptoms which attend this affection in the female are similar to those which characterize it in the other sex, the most urgent being incontinence of urine and bearing-down pains. In sounding, the patient is placed upon her back, on the edge of the bed, and the instrument, a short steel rod, slightly curved at the extremity, is carried about through the interior of the bladder, so as to explore, if necessary, every recess of this organ. In young children, the finger may, if deemed advisable, be inserted into the rectum; but in grown subjects it is best always to introduce it into the vagina.

Stones in the female occasionally acquire an enormous bulk, and may seriously interfere with labor by preventing the descent of the child's head. In general, however, they are comparatively small, and do not weigh more than six, eight, or ten drachms. In some instances, although rarely, the concretion projects into the urethra; and occasionally it has been known even to protrude at the outer opening of that passage. When this is the case, the patient almost always suffers from incontinence of urine, and from the various other evils incident to that disagreeable affection.

A number of cases are upon record in which calculi of large size have been expelled spontaneously from the female bladder.

The urethra, under such circumstances, is gradually dilated, and probably also much shortened, from the pressure exerted upon it by the foreign body, which thus paves the way for its own evacuation. The expulsion is sometimes effected suddenly, perhaps under the influence of a violent attempt at micturition, or an effort at coughing, sneezing, or vomiting; but, in general, it is accomplished slowly, and with more or less pain and difficulty in voiding the urine. Instances of the spontaneous discharge of stones, weighing two, three, four, five, and even twelve ounces, are mentioned by Callot, Molyneux, Beards, Baker Brown, Middleton, Botti, Klauder, Garden, Wilks, and others. Occasionally the calculus is evacuated through the vagina, in consequence of ulceration of the anterior wall of this tube. Such an occurrence is fortunately rare, for it is generally, if not always, followed by a permanent fistule.

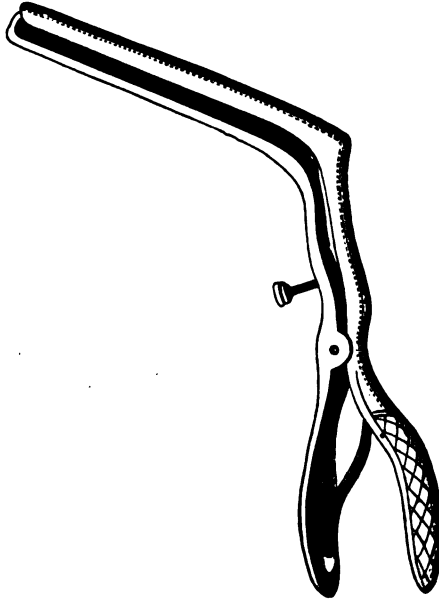
Treatment.—Various plans have been proposed and practised for the extraction of calculi from the female bladder. Of these only a few need be considered, as the rest are either obsolete, or are seldom required.

I. Dilatation.—The method of dilatation has been practised from an early period of the profession, and has been received with various degrees of favor by different operators. It is more particularly adapted to small concretions, unaccompanied with any serious disease of the urethra and neck of the bladder. The dilatation may be effected slowly by sponge tents, but this procedure is now generally discarded, as it is liable to be followed by incontinence of urine. Rapid dilatation, on the other hand, is not open to this objection, although calculi measuring, with the forceps, two inches in diameter have been successfully removed in this way.

The patient being under the influence of chloroform, a conical steel bougie, or the dilator represented in fig. 86, is introduced and expanded rapidly and sufficiently far to admit the finger and the forceps. Greater accuracy, when the size of the stone is determined, as to the amount of dilatation necessary, in any given instance, may be attained by the use of Simon's specula, represented in fig. 32, the largest of which measures two-fifths of an inch in diameter. In the event of difficulty being encountered in extracting the stone, it should be crushed by powerful forceps, and removed piecemeal.

The risks of incontinence after the two methods of dilatation are fairly set forth in a table by Mr. Bryant.¹ Of 13 cases of

Fig. 86.



Urethral Dilator.

slow dilatation, four recovered with incontinence; while of 15 cases of rapid dilatation, all recovered without this distressing feature. These facts do not require comment.

II. Lithotritry.—Crushing may be employed when the bladder is healthy, and when the stone is comparatively soft, and yet so large as to render it impossible to extract it by dilatation of the urethra. Indeed, I am well satisfied that almost any calculus, unless extremely hard or voluminous, may be disposed of in this way, and it is only surprising that the procedure is so seldom employed. The object may be effected either with stout forceps, or a short lithotrite, the fragments being removed at once with small lithotomy forceps and the syringe. Of 18 operations, tabulated by Mr. Bryant, all recovered, but two of the patients suffered from incontinence of urine. In one of these cases, how-

¹ Med.-Chir. Trans., vol. xlvii., 1864, p. 164.

ever, the urethra was incised laterally, and, in the other, it had been subjected to dilatation at intervals for three weeks.

III. Lithotomy.—Calculi may be removed from the female bladder by cutting operations in several ways. Whichever method may be selected, the patient is anæsthetized and placed in the ordinary position, and the incision made on the staff, represented in fig. 87.

a. Urethral lithotomy. In this procedure, the incision, made with a straight probe-pointed bistoury, includes the entire urethra and neck of the bladder. It may be carried

Fig. 87.



directly upwards towards the pubic symphysis, or directly downwards, or downwards and outwards on both sides, or downwards and outwards on one side, towards the tuberosity of the ischium, as may suit the ideas of the surgeon or the requirements of the case. When the concretion is very large, the last procedure, which is analogous to the lateral operation in the male, will give an abundance of room. In this way the late Dr. J. Kearney Rodgers, of New York, succeeded in extracting a uric acid calculus, which weighed nine ounces and five drachms, and measured nine inches and a half in its long, and seven inches and three-quarters in its short circumference. No incontinence of urine followed, and the patient was perfectly well thirty years afterwards.

The great objection to incising the urethra is its liability to be followed by incontinence of urine, which occurred in 9 of 20 cases tabulated by Mr. Bryant. For this reason, the operation should be avoided.

b. Vaginal lithotomy. The removal of a calculus by colpocystotomy or cutting into the bladder through the anterior wall of the vagina, first practised by Rousset in the latter part of the sixteenth century, was warmly advocated by Vidal, and is recommended by Dr. Marion Sims, Dr. Emmett, and Dr. Aveling, of Sheffield, England, who has made an interesting contribution on the subject.¹ The operation may be required for very large calculi, in which dilatation is

Female Staff.

¹ Trans. Obstetrical Society, vol. v., 1864, p. 1.

inapplicable, or in which the condition of the bladder forbids lithotrity, but it should not be practised when it is possible to avoid it. The vagina having been expanded with a duck-bill speculum, and the vesico-vaginal septum rendered prominent by pressing the handle of the staff backwards, a lithotomy knife is thrust into the groove of the staff, and an incision, commencing one inch and a quarter posterior to the meatus, carried exactly in the middle line, sufficiently far for the easy extraction of the stone. The edges of the wound are then brought together, as in the operation for vesico-vaginal fistule, and the after-treatment conducted on similar principles.

Of 35 cases collected by Dr. Aveling, only one proved fatal, but from the fact that the majority of operations were performed before the recent improvements in sewing up the wound, the probability is that the majority were the subjects of incontinence of urine. M. Vidal had thirty cases without a single death; but a fistule often followed. Of 43 cases in the hands of American surgeons, all were successful. Dionis, who operated by double lateral incisions, subjected three-fourths of his patients to incontinence of urine. Hence, the operation should only be performed when the stone can be removed in no other way.

γ. Suprapubic lithotomy. Finally, when the stone is of unusual magnitude, and vaginal lithotomy is deemed inadvisable, epicystotomy may have to be resorted to. Professor Parker, of New York, has opened the bladder four times above the pubes, and his patients made satisfactory recoveries. Dr. Pitcher, Dr. Weber, and Dr. Westmoreland have each had a case in young children, and with equal success. Indeed, the operation seems to be more favorable in females than in males. Thus, of 82 cases in females tabulated by Dr. Dulles,¹ 72 recovered, and 10, or 1 in 8.20, died; while of 383 males, 258 recovered, and 125, or 1 in 3.06, proved fatal.

Whatever procedure be adopted, I conceive it to be a matter of primary importance that the patient should be kept perfectly at rest and recumbent, until the parts have regained their original tone. This should be done not merely where incision has been practised, but even where the operation is limited to dilatation. By observing this precaution, the risk of incontinence of urine will be greatly diminished.

¹ Op. cit., p. 47.

It occasionally happens that urinary calculi are met with in pregnant or parturient females, and that they interfere with natural labor. Should the true cause of the obstruction be overlooked, both mother and child may be sacrificed, as in the case related by Mr. Threlfall,¹ of Liverpool. In any event, there is always risk of the formation of a fistule, from sloughing, the result of the pressure exerted upon the vesico-vaginal septum by the stone and the descending foetal head.

The proper remedy is to extract the stone during gestation, if its presence be suspected. If, during labor, it be placed below the head of the child, attempts should be made to push it back into the body of the bladder; but when these manœuvres fail, it must be removed by one of the operations already discussed, that one being selected which meets the requirements of each individual case.

¹ Edinburgh Med. and Surg. Journ., vol. xxxi. p. 56.

CHAPTER XI.

FOREIGN BODIES IN THE BLADDER.

THE foreign bodies that may find their way into the bladder are too diversified in their character to admit of any very precise enumeration. The most common, however, as well as the most important, are portions of catheters, needles, pins, balls, bits of wood, as pencils and penholders, fruits and kernels, fragments of plants, as ears of corn and stalks of wheat, foetal débris, fragments of bone, needle cases, pipe stems, glass tubes, pebbles, and pessaries. Such bodies may be introduced into the bladder either accidentally, as in the case of balls and splinters of bone; or, they may be thrust up designedly, but with no intention of leaving them in this unfortunate situation. Many a poor fellow, in the act of committing onanism, has unwittingly introduced a catheter, piece of straw, wood, or wire, into the urethra, from which it soon after slipped into the bladder. Surgeons have often broken off the catheter in the bladder, and a bougie has occasionally met with a similar mishap. The elm-bark bougie, at one time used a good deal in the Southwest, has several times, within my knowledge, broken off in the bladder, from which it was obliged to be subsequently removed by an operation. In cauterizing the neck of the bladder for the cure of seminal weakness and other affections, the cup of Lallemand's porte-caustique has been repeatedly left in the interior of this organ, much to the annoyance and chagrin of the surgeon. Accidents of a similar character formerly occasionally happened in the operation of lithotrity. Balls sometimes enter the pelvic cavity, and from thence gradually find their way into the bladder by ulcerative absorption. In the same manner a fragment of bone, detached by external violence, or the effects of disease, has repeatedly been known to pass into this organ, as have also the contents of dermoid cysts of the ovary.

However introduced, the effects upon the foreign substance and the bladder are generally similar, or at any rate, if they

differ at all, they differ only in a very slight degree. The extraneous body excites cystitis and usually becomes incrustated in a very short time with earthy matter, the deposit of which often proceeds with extraordinary rapidity, and sometimes attains a large bulk in a few months. The deposit is generally of a lithic or phosphatic nature; in rare cases, it is oxalic. The symptoms awakened by the presence of the intruder, whatever it may be, are similar to those which characterize stone in the bladder. The diagnosis is commonly easily established by the history of each particular case, aided, where any doubt remains, by a careful exploration with the sound.

A long, inflexible, and hard foreign body, introduced into the bladder, whether designedly or otherwise, will occasionally perforate its walls, and, escaping into the peritoneal cavity, excite fatal inflammation. A very extraordinary instance of this nature occurred in Vermont, in the practice of Dr. Pond,¹ in a man, fifty years of age, who had been in the habit of indulging in masturbation. One day, he introduced a leaden bougie, ten inches in length by three-quarters of an inch in diameter, and weighing seventeen ounces, which inadvertently slipped from his fingers, and passed beyond his reach along the urethra. Severe suffering was the result, and the foreign body was easily detected in the bladder, both by the sound and by the finger in the rectum. An operation was determined upon, but before the man could be induced to submit to it, the bladder gave way, and the bougie passed into the abdomen. Gastrotomy being at length performed, the substance was found to be entirely lodged in the peritoneal cavity, having escaped from the bladder through a rent in its posterior wall. For a while, the patient seemed to be in a fair way of recovery; but, at the end of the ninth day, he became unmanageable, and broke open the wound, and died in a fortnight after the occurrence of the accident.

When the extraneous substance is small it may be expelled spontaneously. Instances are recorded by Elscholtz, Van der Wiel, Magnetus, Stickney, and Lauderdale, in which shot, fragments of iron, or balls, were sufficiently small to escape through the urethra. A bullet, of ordinary size, might be removed

¹ New York Journ. Med. and Surgery, New Series, vol. ix. p. 105.

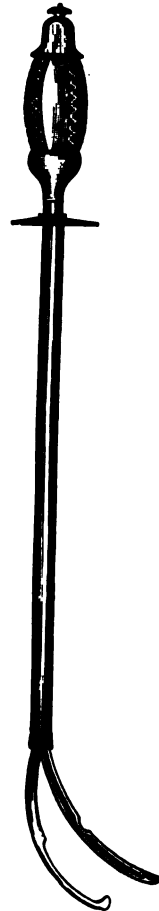
simply by dilating the urethra; or, this failing, by Cooper's forceps. Dr. H. L. W. Burritt has reported a case in which, after previous dilatation of the urethra, a piece of bougie, three inches in length, was expelled by the projectile force of a full stream of urine, retained only for four hours. In females, rapid dilatation with the finger, or with the instruments already alluded to, while the patient is under the influence of chloroform, gives ready access to the interior of the bladder, when the extraneous substance may be removed with a pair of delicate lithotomy or polypus forceps.

Many cases are on record in which bits of elastic catheters and bougies were extracted with the forceps, represented in fig. 88, or by the lithotrite. It is not always easy, however, to seize soft catheters, as I know from personal experience. In a case of this nature, in a man, sixty-three years of age, I was obliged to make the median incision of lithotomy, and only succeeded, after patient efforts, in extracting, with a large brass bullet probe, bent at nearly a right angle, a No. 12 conical bougie, which was curled up in the depression behind an enlarged prostate gland. When the foreign body is a pin or needle, it may sometimes be entrapped in the eye of a catheter, as in the memorable case of La Motte.

The removal of pessaries, introduced either through mistake or design, as in the cases recorded by Storer, Byford, Edwards, Woolen, and others, should, if possible, be effected by rapid dilatation of the urethra, combined, if it be found necessary, with crushing the foreign body. If it becomes indispensable to open the bladder through the vagina, the wound should be at once closed with wire sutures.

In shot wounds of the bladder, the ball, if retained, generally forms the nucleus of a stone, while bits of clothing and splinters of bone are ordinarily eliminated by the urethra. The only remedy is cystotomy, an operation first performed

Fig. 88.



Forceps for Extracting Foreign Bodies from the Bladder.

by Frère Jacques, in 1698. Of thirteen cases collected by Mr. Dixon, of London,¹ ten recovered and three died. During our late war there were twenty-one examples of lithotomy for the removal of concretions consequent upon wounds of the bladder. Of these, seventeen recovered, three were fatal, and in one the result is not known. Of twelve lateral operations, one died; of three suprapubic, two died; while three bilateral, and two median operations were successful. In ten cases leaden bullets, in one case a canister shot, in one a fragment of a grenade, in one an arrow head, in three splinters of bone, in one a bit of cloth, in one a tuft of hair, in one inspissated mucus, and in one blood, were more or less incrustated with phosphatic deposits, or formed the nuclei of large calculi.²

In an exhaustive paper on foreign bodies in the bladder, M. Denucé,³ of Bordeaux, has collected 125 cases in which lithotomy was resorted to for their removal. In males, perineal incisions were practised in 87 instances; recto-vesical in 2; and suprapubic in 2; in females urethral or vaginal lithotomy was performed in 22, and the high operation in 12. In only 61 of the cases is the result given. In 39 males, perineal lithotomy was practised in 36, with 5 deaths, epicystotomy in 2, both of which recovered, and recto-vesical section in 1, which terminated fatally. In 22 females, 2 out of 15 urethral or vaginal operations, and 5 out of 7 hypogastric, died. Of the entire number, therefore, 48 recovered, and 13 died.

¹ Med. Chir. Trans., vol. xxxiii.

² Med. and Surg. Hist. of the War of the Rebellion, Surgical Volume, Part ii. pp. 262-308.

³ Moniteur des Hôpitaux, Nos. 126, 127, and 128, 1856.

CHAPTER XII.

WOUNDS OF THE BLADDER.

WOUNDS of the bladder may be incised, punctured, contused, lacerated, or gunshot, according to the kind of weapon with which they are inflicted. They are not uncommon in military practice; but it is interesting to note that there was not a single instance of a punctured, incised, or lacerated wound during our late war. From the situation of the viscus, these injuries must always necessarily be complicated with lesion of the soft parts by which it is surrounded, and also not infrequently with fracture of the pelvic bones.

Incised wounds of the bladder are very uncommon. The organ has been opened accidentally by the surgeon when it formed a hernial protrusion in the inguinal or femoral regions, as in the instance which happened to Roux. Fodéré has recorded the case of a man who plunged a knife above the pubes into the viscus, to relieve a painful retention of urine. The peritoneum was not injured, and recovery ensued. The prognosis of these injuries is far worse than that of shot or other lesions of the bladder, the majority proving fatal from infiltration of urine, particularly when the peritoneum is involved, within forty-eight hours.

Punctured wounds are usually produced by falls upon upright pieces of wood, as a stake, a brush handle, or the broken branch of a tree, as in a case which came under my observation, the foreign substance penetrating the bladder through the perineum, the abdominal walls, the rectum, or vagina. Notwithstanding their apparently desperate nature, these injuries are frequently recovered from with scarcely any treatment; but when the vagina or rectum is implicated, they are liable to be followed by fistule. When sinuses refuse to close, a careful examination will show that the discharge is kept up by portions of the clothing forced into the bladder at the time of the accident, or by broken off fragments of wood.

Contused wounds and contusions are more common than punc-

tured and incised injuries, and are generally inflicted by blows, falls, or the pressure of the foetal head in protracted labor, or the pressure of a large calculus during parturition, through which the vesico-vaginal septum is exposed to compression both from without and within. As a natural result the lower wall of the bladder and the anterior wall of the vagina mortify, and a fistule results. Baron Larrey describes the case of a soldier whose bladder was contused without being penetrated by the horn of a bull, and formed a hernial protrusion beneath Poupart's ligament.

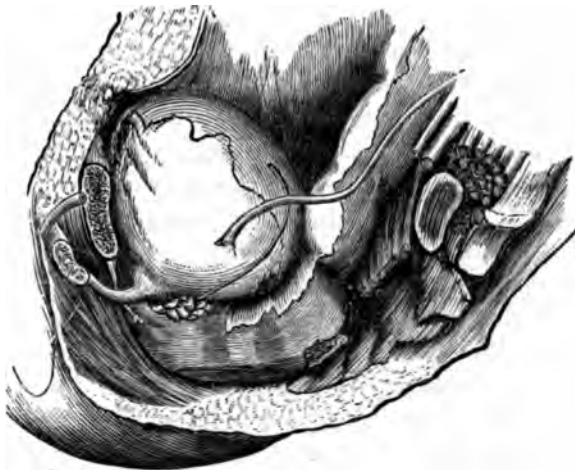
Lacerated wounds are generally inflicted by blows, falls, or kicks upon the hypogastrium, by the body being forcibly jammed between two hard and resisting objects, by the instruments employed in embryotomy, as in a case mentioned by Sancerotte, by the forcible use of the catheter, as in the case of a female reported by Bérard, and by the lithotrite, of which not a few instances occurred during the early days of crushing, either through the fault of the operator, or the bad construction of the instrument. These injuries usually terminate fatally.

A wound, however produced, may perforate the bladder, or merely pierce one of its walls; in the former case, there will be two openings; in the latter, only one. Again, the lesion may involve the peritoneum, or it may take place in front and below where it is destitute of a serous investment, circumstances which have an important influence upon the prognosis and treatment of the accident.

Shot wounds of the bladder, although less fatal than punctured and incised wounds, are often extremely formidable, destroying the patient immediately or remotely, producing extensive mischief among the soft parts, as well as in the pelvic bones, and leading to the formation of abscesses, sinuses, and fistules, which may last for months and years, and render life utterly miserable. When the ball is impelled with great velocity, it will be apt to enter the organ at one point, and pass out directly opposite at another, thus leaving two apertures, and either lodging in the neighborhood, or issuing at the surface of the body. If, on the contrary, it move slowly, or be nearly spent, it will be likely to make only one opening, and to be arrested in the bladder, from which it may ultimately be discharged by the urethra, or by a fistulous passage; or, what is more probable, it will become

incrusted with earthy matter, and thus form the nucleus of a calculus. Instead of effecting direct penetration, the missile may enter by ulcerative absorption, as occurred in seven of the thirteen cases of removal of projectiles during our late war. In several examples, narrated by Larrey, the ball was lodged in the walls of the viscus, partly without and partly within its cavity; and he ascribes non-penetration to the loss of momentum of the projectile, to the sudden contraction of the bladder, and to the resistance offered by the urine it may contain. The lesion is often complicated with fracture of the pelvic bones, injury of the large vessels, and perforation of the rectum, as in fig. 89, the

Fig. 89.



Shot Perforation of the Bladder and Rectum.

small intestines, the uterus, the vagina, or the genital organs. In the former case, serious mischief is sometimes done by the osseous splinters which the ball makes and detaches in its course towards the bladder, and which not infrequently find their way into the interior of this organ, where they may give rise even to more disastrous consequences than the ball itself. Wadding, pieces of cloth, or portions of the patient's attire, may accompany the ball, and be temporarily or permanently retained in the bladder.

In a gunshot wound, the danger of extravasation is not always primary, but sometimes secondary. The ball may have penetrated the coats of the organ obliquely or in a sort of valvular manner,

or it may have been unusually small. In either of these cases, the urine may not escape at all, or the occurrence may be postponed until the separation of the sloughs. This will usually happen at some period from the seventh to the twelfth day, and during this time the patient should be closely watched, otherwise serious, if not fatal, mischief may be the result.

It has been already stated that the ball, if lodged in the bladder, is variously disposed of. In the generality of cases, it soon becomes incrustated with earthy matter, which gradually increases in quantity until a considerable-sized calculus is the result, producing all the symptoms of a common concretion, and requiring, perhaps, the operation of lithotomy for its removal. More rarely, the ball causes ulcerative absorption, and is finally discharged through the perineum, or the rectum; usually the latter, since it always has a tendency to fall into the bas-fond of the bladder. It is possible that the foreign body may become encysted, without producing any decided symptoms. When the ball is very small, it may escape externally through the urethra, of which occurrence several instances are mentioned in the preceding chapter.

Pieces of wadding, of cloth, and of bone, introduced into the bladder, either alone, or in union with the ball, are ordinarily discharged through the urethra. Sometimes, however, they are retained, and form the nucleus of a calculous concretion.

Wounds of the bladder, however small or insignificant, are amongst the most dangerous accidents to which a human being is exposed. It was formerly considered that all such lesions were necessarily fatal within a short period of their occurrence. Modern observation, however, has long since disproved the validity of this conclusion, by showing that recoveries are by no means infrequent, and that, too, under circumstances apparently the most desperate. Of 183 cases of shot wounds that occurred during our late war, 87, or 47.5 per cent., survived, although a large majority suffered from serious disabilities and infirmities. In 7 cases there was persistent urinary fistule, from the presence, in most instances, of dead bone; 13 patients recovered with recto-vesical fistule; 17 survived the operation of lithotomy for the removal of concretions consequent upon the injury; while examples of cure with the functions of the bladder completely restored were rare. In the majority of the fatal cases, one or more of the pelvic bones were fractured, and the most frequent

cause of death was urinary infiltration, giving rise to peritonitis or diffuse cellulitis, and followed by septicemia or pyemia.

The circumstances favorable to recovery are a small opening, and oblique penetration of the cavity of the bladder, the viscus being at the same time nearly or quite empty, through which the risk of effusion of urine is greatly diminished.

A wound involving a part of the bladder that is uncovered by peritoneum, is less dangerous than one in which this membrane is injured. The urine in the former case escapes into the subserous connective tissue, where, although it may awaken severe inflammation, followed, perhaps, by abscess or gangrene, it is less deleterious than when it finds its way into the general cavity of the abdomen, where its presence almost invariably causes death in a few days. The experience of our late war teaches that such injuries heal readily, provided the bladder be kept at rest by affording a free exit for the urine. Hence, a wound of the inferior part of the bladder is less likely to prove serious than one affecting the body or fundus of the organ, particularly if made with the spherical ball. Thomson met with not less than 14 cases of this kind after the battle of Waterloo, and Guthrie refers to 6 similar examples. Larrey, who saw a number of instances of gunshot wounds of the bladder in Egypt and Syria, states that they generally terminated well. That wounds inflicted by cylindro-conoidal projectiles do not always cause death is attested by the fact that of 10 examples which occurred during our late war of the removal of projectiles, incruited with phosphates, or forming the nuclei of large stones, from the bladder, only 3 were round, while 7 were conical.

The symptoms of this lesion are, the existence of an opening in the lower part of the hypogastric region, the groin, or the perineum; sudden and acute pain in the situation of the affected organ, extending along the urethra, and often accompanied by slight priapism; an escape of urine, or urine and blood, at the external wound; frequent but ineffectual attempts at micturition; violent tenesmus; and a discharge of blood from the urethra. The system labors under all the effects of a violent shock. The countenance is pale and ghastly, the breathing is hurried and oppressed, the pulse is small and feeble, the stomach is nauseated, and the surface is covered with a cold, clammy perspiration. When the injury is complicated with perforation of

the bowel, fecal matter, mucus, bile, or gas, mixed with urine, or urine and blood, may issue both at the external opening and at the urethra. When the pelvic cavity is pierced, the state of collapse, the usual consequence of the accident, is speedily followed by symptoms of peritonitis, of which the patient almost always dies in two or three days. When the bladder is wounded through the perineum or above the pubes, at a point where it is uncovered by serous membrane, urinary infiltration is liable to take place, and the probability of the occurrence will be so much the greater if the external opening is disproportionately small, if the track of the wound is narrow and devious, and if the organ was much distended at the time of the accident.

The discharge of urine at the external wound may be momentary, or it may last for a considerable period. It is sometimes continued; but for the most part it is intermittent, and exceedingly irregular in regard to its quantity. In some instances, all the urine escapes by the external wound, especially if this be situated in the perineum or in the rectum.

In the treatment of a wounded bladder, two prominent indications are presented: first, to prevent extravasation of urine; and, secondly, the occurrence of undue inflammation.

Unfortunately, the first of these accidents often takes place at the moment of the injury, and consequently before the surgeon has an opportunity of interfering. When the bladder is distended, it matters not where it is laid open, whether at a part invested by peritoneum or not, effusion of urine will be inevitable. When the general cavity of the abdomen is penetrated, the contact of the fluid will in a few hours set up intense peritonitis, which is usually beyond control. The disease proceeds in spite of the best directed efforts to combat it. This being the fact, the patient's only chance consists in preventing its occurrence. This is to be attempted by attention to position, and by the instant evacuation of the bladder. The patient should be placed almost semierect in bed, and an elastic catheter with an opening in its point should be left in the bladder, where it is to be secured in the usual manner, to enable the urine to pass off as fast as it is secreted. In a word, the organ should be kept constantly empty and quiet for the first fifteen or twenty days, or until there is reason to conclude that the wound is closed, and all risk of infiltration over. When extravasation has actually occurred,

the bladder should be opened through the perineum, as suggested in the succeeding chapter.

The development of undue inflammation is to be prevented by the employment of antiphlogistic means. Foremost amongst these are general and local bleeding, calomel and opium, and hot fomentations to the abdomen. Anodynes must be given in full and sustained doses, both by the mouth and by the rectum, to allay pain and spasm of the bladder, induce sleep, and diminish the renal secretion. The drinks must be cooling and demulcent, but not abundant; the diet must be perfectly light and bland, and the bowels must be disturbed as little as possible during the first fortnight. Abscesses, the result of urinary infiltration, are to be opened by early and free incisions.

Nothing can be gained by an attempt to extract the foreign body, when the injury has been produced by firearms; for the very moment it is inflicted the urine escapes, and the bladder contracts upon itself so as to destroy the relations between the external and internal wounds. If the ball has fallen into the bladder, it may, if not too large, either pass off spontaneously, or be removed with the forceps; should it be otherwise, and severe symptoms be caused by its presence, it must be cut out through the perineum by an operation similar to that of median lithotomy. This may be done immediately or within a short period after the accident, if the ball has entered beneath the pubes, for the reason that the organ will not only be freed thereby of a disagreeable intruder, but also because there will be less risk of urinary infiltration.

CHAPTER XIII.

RUPTURE OF THE BLADDER.

THE urinary bladder, like the other hollow viscera, is liable to rupture, from overdistention, or from external violence. When the laceration takes place as a consequence of the inordinate accumulation of urine from paralysis of the muscular fibres of the bladder, hypertrophy of the prostate gland, or obstruction of the urethra, there is almost always some degree of softening of the different coats of the organ, thus predisposing them to this occurrence. In such a case, it is only necessary for the patient to use some unusual or sudden exertion, such as sneezing, vomiting, or straining at stool or micturition, to produce the effect in question. The pressure of the diaphragm and the abdominal muscles under such circumstances upon the overdistended viscus, is equivalent to a tolerably severe blow, kick, or fall upon the hypogastric region, the most common cause of the accident when it results from external injury. A similar predisposition is sometimes established by the ulcerative process, and by excessive inflammatory action, eventuating in partial gangrene. The laceration when thus produced usually occurs at the bas-fond of the bladder, and is generally of small extent.

But the most common cause of the accident is external violence, and it is worthy of remark, both in a surgical and a medico-legal point of view, that it may occur from the most trivial injury. Any force suddenly applied to the hypogastric region, as a smart blow, a kick, or a fall, will frequently suffice to produce it. For the force, however, to be effective, it is necessary that the bladder should be distended at the time of the accident. If it is empty, or only partially filled with urine, the blow, unless directed with great precision, will be inoperative. The rupture most commonly occurs in brawls, in which the individual, generally under the influence of liquor, receives the weight of the body of his antagonist upon his abdomen, or

in which this part is struck with the head, hand, elbow, foot, or knee. It may also be caused by a fall from a considerable height, by the pelvis being jammed between two hard and resisting objects, as a wall and the wheel of a carriage, or by striking the hypogastrium against a post, a stone, or the corner of a table. The accident may occur in females during parturition, in consequence of the pressure of the child's head, when the patient has neglected to empty the bladder; and it occasionally happens from overdistention of the viscus, consequent upon retroversion of the uterus; or during the attempts which are necessary to restore the dislocated organ to its natural position.

The age of the patient does not appear to exert any marked influence upon laceration of the bladder from mechanical causes, whether these causes act through the abdominal parietes, through the uterus, or through the pelvic bones. Laceration depending upon overdistention of the bladder is most common in old subjects, in whom the powers of life have been enfeebled by protracted suffering, and is usually associated with softening, and attenuation of the different tunics of the organ. King,¹ Howship,² and Malgaigne,³ have each published a case of the accident as occurring in the foetus. The lesion, from both causes, is, for obvious reasons, more common in males than in females.

When caused by external violence, the accident may be complicated with fracture of the pelvic bones, laceration of some of the parenchymatous organs, as the spleen, liver, or kidney, and injury of the vessels, attended with internal hemorrhage. It is worthy of notice, especially in a medico-legal point of view, that it may occur without any mark of violence upon the surface. In many cases, however, there is more or less contusion with ecchymosis of the skin, connective tissue, and muscles of the hypogastric region, and sometimes also of the pubes and perineum.

The rent may be perpendicular, oblique, or transverse. Its edges are uneven, ragged, and everted. In some instances it is considerably diminished in size by a protrusion of the mucous membrane; and now and then it looks as if it had been made with a punch or sharp instrument. In extent it varies from a

¹ Guy's Hospital Reports, ii. p. 510.

² Op. cit.

³ Vidal, *Traité de Pathol. Externe*, t. v. Sec. ed.

few lines to several inches, being at one time so small as hardly to admit a common-sized quill, and at another so large as to receive a small fist. Several lacerations occasionally exist, but usually there is only one. There is no regularity in regard to the seat of the lesion. It is most common, however, in the posterior wall of the bladder, next in the anterior wall, then at the fundus, and lastly at the *bas-fond*. The neck also sometimes suffers; and cases occur in which the viscus is literally torn from its attachments to the pelvic bones. Of 37 cases due to external violence, collected by Houel,¹ 15 involved the posterior wall and 12 the anterior wall, 3 the sides, and 2 the summit; 3 were double, and in 2 the situation is not stated. Traumatic rupture of the posterior wall nearly always extended through the peritoneum, whereas, in the other situations, this membrane generally remained intact. Of 7 spontaneous ruptures, on the other hand, the posterior wall was involved in 5, and the *bas-fond* in 2; and it is noteworthy that the peritoneum remained intact in all. Of 78 cases analyzed in 1851, by Dr. Stephen Smith,² the posterior wall suffered in 50, the anterior wall in 9, and the neck in 6. The peritoneal investment may be involved in the rent, or this membrane may retain its integrity, and all the other coats give way. In this way the lesion may be partial or complete. In the former variety, the urine, instead of escaping into the pelvic and abdominal cavities, is extensively infiltrated into the subserous connective tissue of the pelvis, and of the abdominal muscles, and the peritoneum, at the seat of the lesion, bulges out in the form of a small translucent pouch.

The accident usually reveals itself by well-marked symptoms, both general and local. Violent pain is instantly experienced in the hypogastric region, the face is pale and ghastly, the pulse is small, rapid, and fluttering, the respiration is hurried and difficult, the extremities are cold, and the surface is covered with a clammy perspiration. The patient occasionally falls down in a state of insensibility, as if he had been struck on the head or stomach; but this is not always the case; for sometimes he is able to walk about, and perhaps go some distance before

¹ *Des Plaies et des Ruptures de la Vessie*, Paris, 1857, pp. 64 and 68.

² *New York Journ. of Med. and Surg.*, N. S., vol. vi. p. 374.

bad symptoms appear. Not infrequently he feels as if something had burst or given way in his abdomen, attended, perhaps, with a crack, or audible noise. In nearly all cases there is a constant desire to urinate, and an inability to pass a single drop of water. A small quantity of blood often flows by the urethra. These symptoms are soon followed by nausea and vomiting, intense thirst, excessive restlessness, and an expression of intensive suffering, with swelling and tenderness of the abdomen. The period of collapse may last from a few minutes to several hours or even days, and the patient may die from the shock of the system, or reaction may occur, and he may perish from the effects of peritonitis.

The introduction of the catheter is generally followed by a flow of bloody or turbid urine, and not infrequently by blood alone, either fluid or partly fluid and partly coagulated. The instrument enters without difficulty, and the point sometimes passes through the rent of the bladder into the peritoneal cavity, where it may be made to move about in different directions, and even be felt by the finger across the walls of the abdomen.

Of these symptoms, the most worthy of reliance, in a diagnostic point of view, because the most constant, are the sudden pain in the hypogastric region, a frequent but fruitless effort to urinate, an escape of blood by the urethra, the inability of the surgeon to relieve the bladder with the catheter, and the rapid collapse of the system. The sensation of tearing, or giving way, is often absent, and so is also the crack or audible noise. The character of the pain is not to be disregarded. It always comes on at the moment of the laceration, and is generally so violent as to induce extreme faintness with all the other symptoms of prostration. It may be sharp or lancinating, hot or burning, colicky or cramp-like. The symptoms now enumerated, added to the history of the case, leave no doubt in regard to the nature of the lesion.

In laceration of the bladder external to the peritoneum, or in the partial variety of the affection, the symptoms are equally severe in the first instance, but the reaction generally takes place sooner, and there is a longer interval between it and the occurrence of peritonitis. The pain during this period is less violent, the abdomen is not so tender under pressure, the pulse

is not so much depressed, and there is less prostration of strength. More urine, too, flows by the catheter.

The state of collapse, having continued for some time, is at length followed by a certain amount of reaction, which is itself speedily succeeded by symptoms of peritonitis. The countenance now becomes flushed, the skin is hot and dry, the pulse is small, quick, and wiry, the belly is tympanitic and exquisitely tender on pressure, the limbs are drawn up to relax the abdominal muscles, the respiration is quick and hurried, and the patient is often delirious at an early period of the attack. By and by, hiccup sets in with bilious vomiting, the pulse fails at the wrist, the surface is bathed with a cold, clammy sweat of a urinous odor, the countenance becomes Hippocratic, and the patient falls into a state of coma, under which he gradually expires.

On dissection, the ruptured organ is usually found to be very much contracted, and hardly ever contains more than a few drachms of urine. In some instances, especially in the partial varieties of the lesion, it is considerably dilated, from the presence of coagulated blood.

The edges of the rent are generally ragged, sloughy, and of a deep red or purple color; and the lining membrane of the organ exhibits evidence of high inflammatory action. All the tunics, in fact, are frequently softened, and altered in their appearance. The surface of the bladder is incrustated with lymph, and united to the neighboring parts; the intestines adhere to each other; the peritoneum is highly injected, and of a deep red color; and the abdominal cavity contains more or less urine mixed with serum, lymph, and blood. In protracted cases, there is sometimes, in addition to these fluids, an effusion of pus. The quantity of urine present may be very small, or it may amount to several quarts. The same remark applies to the accumulated blood. When death occurs soon after the accident, neither the bladder nor the peritoneum exhibits any marked evidence of inflammation. In partial rupture, the subserous connective tissue of the bladder, of the pelvic cavity, and of the abdominal muscles, is gangrenous, and infiltrated with urine; the peritoneum is highly inflamed; the bladder is softened and discolored; and the abdominal cavity contains more or less serum and lymph.

Sometimes the inflammation is limited to the neighborhood

of the bladder, and an effort is made by nature to repair the injury by an abundant effusion of lymph. In this manner a sort of adventitious sac may be formed, in which the urine, or the urine and blood, may accumulate, and thus be prevented from inducing fatal peritonitis.

Laceration of the bladder is nearly always fatal. Indeed, there are, so far as I know, not more than eight cases of recovery from this injury upon record. Death usually takes place within the first five days after the occurrence of the accident. It may, however, be postponed until a later period; and a case is mentioned by Dr. E. R. Peaslee¹ where the patient, a man, aged thirty years, survived forty-two days. The laceration was situated at the neck of the bladder, and was complicated with wound of the perineum and fracture of the pelvic bones. Large abscesses were found in both iliac regions after death.

The immediate source of danger from laceration of the bladder is the poisonous effect which the urine exerts upon the nervous system, and which, together with the excruciating pain, appears to be the cause of the collapse into which the patient so frequently falls almost at the moment of the accident. The depression and suffering may be so great as to occasion death in a few minutes, or, at furthest, in a few hours.

Another source of danger is the consequent hemorrhage, which is profuse in proportion to the extent of the laceration, and the size of the injured vessels. When the accident is complicated with fracture of the pelvic bones, a large artery or vein may be implicated, and the individual may speedily sink from exhaustion. The amount of hemorrhage cannot be estimated by the quantity of blood which escapes by the urethra; the bleeding goes on internally, and the fluid collects in the bladder or pelvic cavity. When the blood exists in large quantity, and in a solid state, it may form a hard tumor, which can be easily felt by the hand upon the abdomen or the finger in the rectum.

In an elaborate and valuable monograph to which reference has already been made, Dr. Stephen Smith has analyzed seventy-eight cases of rupture of the bladder, reported by different observers. Of these sixty-seven were males and eleven females;

¹ Amer. Journal Med. Sciences, N. S. vol. xix. p. 383.

making the proportion of the former to the latter nearly as six to one. Three were under ten years of age; three between ten and twenty; nineteen between twenty and thirty; twenty-six between thirty and forty; seven between forty and fifty; and four between fifty and sixty. The ages of the other patients, who were adults, are not given.

The cause of the accident was direct violence in forty-eight of the cases; in fifteen, concussion of the body; in four, parturition; in one, retroversion of the uterus; and in four, stricture of the urethra. In the remainder of the cases, the nature of the cause is not specified.

The primary symptoms are stated to have been severe in fifty-nine of the cases, and it is worthy of note that in forty-three of these the rupture extended into the peritoneal cavity. In nine, of which seven likewise affected the peritoneal cavity, the symptoms were slight, and in three they were entirely absent. In twenty-eight of the cases, there was, from the beginning, inability to urinate; in three, on the contrary, the bladder retained its expulsive power. Bloody urine was drawn in twenty-five cases, and clear urine in four. In seven of the cases, the patients were able to walk after the occurrence of the injury. Seven of the patients felt a sensation at the moment of the accident as of the bladder bursting.

In fifty of the cases, the rupture affected the cavity of the peritoneum, thirty-nine being caused by direct violence, six by concussion or indirect violence, four by parturition, two by stricture of the urethra, and one by retroversion of the uterus. In nine of the cases, the rent existed in the anterior wall of the bladder; of these, five were induced by external injury, one by stricture, and three by concussion. Rupture of the neck of the organ was present in six cases, in five of which it was caused by direct violence. In seventeen of the cases, the bladder was firmly contracted, and in two it was not discovered on the dissection of the body. In thirty-four of the cases, in twenty-seven of which the laceration involved the peritoneum, there were marks of inflammation in the abdomen, while in seven no lesion of the kind was detected. Fracture and injury of the pelvis existed in fifteen cases. In nearly all there was an absence of evidence of external violence.

†

Of the seventy-eight patients seventy-three died; forty-four within the first five days, twenty-two between five and ten days, two between ten and fifteen days, three between fifteen and twenty days, one above twenty days, and one at the end of forty-two days. In those who died soonest, and they constituted the great majority, the rent extended into the peritoneal cavity. In the five patients that recovered, the lesion, in one, was partial, in one it involved the peritoneal cavity, and in three it extended into the connective tissue.

In the treatment of this lesion, our efforts must be directed, first, to affording a free outlet for the urine as rapidly as it is secreted as well as for that already extravasated, and preventing its further diffusion into the surrounding structures; and, secondly, to arresting or controlling the resulting peritonitis or pelvic cellulitis.

To fulfil the first indications, if the surgeon is satisfied that the posterior wall of the bladder is the seat of the laceration, and that there is an accumulation of fluid in the recto-vesical cul-de-sac, as denoted by a fluctuating swelling in that locality, relief might be afforded by the rectal puncture, as originally suggested by Dr. Harrison,¹ as the tendency of the urine is to subside into that fold of the peritoneum. Since, however, it is by no means easy to determine the situation of the rupture, this expedient is as liable to eventuate in failure as in success; and as it would, at the best, merely give egress to the fluid extravasated at the time of the accident, and not prevent its further effusion, it is a remedy, in my judgment, entitled to little confidence. Hence the wiser plan would be to open the bladder, as in the lateral operation for stone, as was first practised by Dr. W. J. Walker,² of Boston, in a man thirty-three years of age. Although there was great depression at the time of the operation, twenty-four hours after the injury, and there was fracture of the pelvic bones, immediate improvement followed, and the man resumed his occupation on the fifty-fifth day. The rent was supposed to have existed in the anterior wall of the organ. Six ounces of urine were drawn off, with marked relief, soon after the receipt of the wound.

¹ Dublin Journal of Medical Science, vol. ix., 1836, p. 349.

² Medical Communications of the Massachusetts Medical Society, vol. vii., case vi., 1845.

The practice pursued by Dr. Walker, in the above case, deserves to be imitated not only when the rupture occupies the anterior wall of the bladder, but when it involves the posterior wall. In an instance of this description, complicated by general peritonitis, from extravasation of urine into the pelvic cavity, occurring in a man, twenty-six years of age, Dr. Erskine Mason,¹ of New York, made the lateral section, sixty-two hours after the accident, and evacuated a large quantity of bloody urine. Under appropriate measures, the peritonitis subsided, and the man was discharged on the thirty-seventh day. This treatment derives support from what occurs in gunshot wounds, in which, the urine having an opportunity of running off by the abnormal opening as fast as it reaches the organ, severe and fatal infiltration is rare. It need hardly be added that the sooner the operation is performed, under such circumstances, the more likely will it be to eventuate successfully.

In the first edition of this work, published in 1851, I suggested the propriety of making an incision through the linea alba, and sponging out the extravasated fluid, but I have never had an opportunity of putting it in practice. In 1862, however, Dr. Walter, of Pittsburgh,² in the case of a man, twenty-two years of age, removed successfully in this way a pint of extravasated urine and blood, which proceeded from a rent two inches long in the base of the bladder. The after-treatment consisted in the liberal exhibition of opium, light diet, and the permanent retention of a catheter. In addition to this precaution, Mr. Holmes³ has recently advised uniting the wound with silver or carbolized gut ligatures.

As soon as reaction has been brought about by the usual remedies, the patient must be carefully watched to guard against the occurrence of general peritonitis. At the approach of the first symptoms, if the condition of the case admits of it, blood should be freely taken from the arm, or the belly should be covered with leeches, followed by hot fomentations. The application of a large blister might be beneficial in moderating and circumscribing the resulting inflammation. Iced milk may be

¹ New York Medical Journal, vol. xvi., 1872, p. 113.

² Med. and Surg. Reporter, Feb. 1862.

³ A Treatise on Surgery, Amer. ed., 1876, p. 246.

allowed in small quantities, to allay thirst and sustain strength, for the first two or three days; and the system should be kept fully under the influence of opium, which forms the sheet-anchor of the treatment. If the patient survives the first effects of peritonitis, abscesses may form and require opening, precisely as in extravasation of urine from rupture of the urethra. Under these circumstances, the treatment must be supporting.

CHAPTER XIV.

FISTULE OF THE BLADDER.

THE lower wall of the female bladder and urethra is liable, either from injury or disease, to various kinds of fistules, deriving their names from the organs with which they communicate, as vesico-vaginal, urethro-vaginal, urethro-vesico-vaginal, vesico-uterine, vesico-utero-vaginal, urethro-vesico-utero-vaginal, and vesico-vagino-rectal. In the following pages I shall confine myself principally to the consideration of vesico-vaginal fistule, pointing out any modifications in the treatment that may be required by differences in the situation or size of the opening; and to vesico-rectal fistule, as it is met with in the male.

SECT. I.—VESICO-VAGINAL FISTULE.

Vesico-vaginal fistule is an opening between the bladder and vagina, attended with a discharge of urine through the latter passage. It is most frequent after the twenty-fifth year, particularly in primiparæ who are advanced in life, and it is occasionally, although rarely, congenital. A case is related in the fifty-sixth volume of the *Dictionnaire des Sciences Médicales*, in which, while the labia, nymphæ, and clitoris were all well developed, there was an absence of the urethra and neck of the bladder, the urine passing off constantly by the vagina through an opening in the vesico-vaginal septum large enough to admit the finger. Dr. Schatz¹ has recorded a remarkable deformity of the genito-urinary system of an infant, in which there was a double uterus, a double vagina, a double bladder, and a double vesico-vaginal fistule.

Although the communication may be produced by the mal-adroit use of instruments, by penetrating wounds of the vagina and bladder, by ulceration, whether simple, venereal, or malignant, by the formation of an abscess, or by the pressure of a

¹ Arch. f. Gynäk., iii. 2, 1873.

urinary calculus, a pessary, or other foreign substance, by far the most common cause of the accident is sloughing consequent upon the pressure exerted upon the septum by the presenting portion of the child in protracted labor.

A great diversity exists in regard to the seat, size, and shape of the abnormal aperture; circumstances of great importance with reference both to the diagnosis and treatment of this affection. The most common sites are at the trigone and bas-fond of the organ; but in many cases it is just below the uterus, and sometimes in the urethro-vaginal septum. The size of the opening may not exceed the diameter of a small shot, or it may be so great as to admit a pullet's egg, a small orange, or even a larger object. In its shape it is generally somewhat oval or circular, but occasionally it presents itself in the form of a transverse, oblique, or longitudinal rent, slit, or fissure. Its edges are usually well defined, rough, callous, and white, with a slight eversion of the vesical mucous membrane. The induration often extends a considerable distance beyond the fissure, especially when this has been caused by sloughing, and hence it is occasionally no easy matter to pare the edges of such an opening with a view to the introduction of the suture. The vagina in the neighborhood of the aperture may be perfectly sound, or it may be variously altered by disease, according to the nature of the exciting cause of the fistule, the violence of the resulting inflammation, and the acrid character of the discharges. It is extremely rare that there is more than one opening.

A singular eversion of the bladder occasionally takes place in vesico-vaginal fistule, the lining membrane passing through the opening so as to form a tumor in the vagina. The protrusion, which is seldom considerable, is generally of so trifling a nature as not to require any particular treatment. When the artificial aperture is unusually large, the whole bladder may project through it, and eventually even protrude at the vulva, as in a remarkable case which was communicated to me in 1852, by the late Professor Howard, of Columbus, Ohio. It occurred in a woman who, during her first labor, five years previously, had received an extensive laceration of the perineum and of the vesico-vaginal septum. Four years afterwards, she gave birth to another child, and some months after that event she observed, for the first time, a tumor in the vagina. Upon examining the

parts, Dr. Howard found that the fundus of the bladder was completely everted, and that it hung through the vulva, in the form of a red mass, of the volume of a large orange, and of a globular shape, with a rounded and rather narrow pedicle, encircled by the edges of the vesico-vaginal fistule. The orifices of the ureters were seen at its posterior extremity, within the vagina. The surface of the tumor was rough, ulcerated, and of a deep reddish color. The woman was in a most wretched condition; her general health was much impaired, and she was unable to stand erect or to approximate her thighs. The urine dribbled constantly from the vagina, thus adding greatly to her suffering.

A female affected with vesico-vaginal fistule must necessarily be an object of the deepest commiseration. Incapable of controlling the contents of her bladder, the urine constantly escapes at the vagina, thus soiling her clothes, and giving rise to the most noisome odors, which no amount of cleanliness can entirely prevent. In consequence of this condition, she is rendered unfit for social enjoyment, and is obliged to spend her life in solitude and retirement. The urine, incessantly dribbling away, chafes and frets the parts with which it comes in contact, and thus renders them unfit for the exercise of their appropriate functions. The escape of urine is constant when the opening is situated at the bas-fond of the bladder, and is always worse in the erect than in the recumbent posture.

Atrophy of the bladder, amounting almost to complete absence of the viscus, may result from unrelieved vesico-vaginal fistule, as in the case of a woman, forty years of age, dead of phthisis, examined by Professor Uytterhøven.¹ Up to the age of twelve, when she began to menstruate, she had complete control over the bladder, when she began to suffer from incontinence, which continued up to her death, due to a urethro-vaginal fistule, the probable result of softened tubercle. The urine being discharged as rapidly as it was secreted, the bladder ceased to act as a reservoir for that fluid, and it became reduced to the size of an ordinary pea. It was lined by mucous membrane, and presented on its inner surface a minute orifice which marked the site of the right ureter, the lower third of which was converted into a

¹ Presse Méd. Belge, No. 20, 1860.

ligamentous cord, and the parenchyma of the corresponding kidney was substituted by a caseous mass contained in a thickened envelop. The left ureter, which was hypertrophied and dilated, opened on a level with the fistule.

The diagnosis of this affection is, in general, sufficiently easy. In most cases, indeed, the escape of the urine by the vagina, instead of through the natural channel, serves at once to point out its true character, whatever may have been the nature of the exciting cause. Its situation, shape, and extent, however, can be determined only by a thorough vaginal examination by means of Sims's speculum. During the exploration the woman may lie on her side, or, what is better, rest on her kness and elbows, with the head as dependant as possible and the nates considerably elevated. The instrument, well oiled, is then introduced in the usual manner, a catheter being at the same time inserted into the urethra. In this way every portion of the vagina may be most satisfactorily inspected, and any opening, however small, easily detected. In some instances, the speculum is advantageously replaced by the finger, which is carried about in different directions, along the anterior wall of the tube, until its extremity comes in contact with the naked end of the catheter. When the aperture is very small, a long slender probe should be used instead of the latter instrument.

The prognosis of vesico-vaginal fistule is, in general, anything but flattering. If a spontaneous cure do occasionally occur, the circumstance is so infrequent that it must always be regarded merely as an exception to one of the most uniform laws of the animal economy. The probability of such an event will be considerably greater, other things being equal, when the accident has been produced by a simple wound than when it has been caused by a severe contusion, followed by a slough, when the opening is small than when it is large, and when the lesion is simple than when it is complicated with other affections. The presence of malignant disease, of course, forbids the hope even of temporary relief by any operation whatever. Nothing but the most determined perseverance and the application of the greatest skill will be likely, even in the more simple forms of the lesion, to eventuate in a complete and permanent cure.

The treatment of vesico-vaginal fistule is palliative and radical; the former consisting in the employment of such means as

are calculated to promote temporary comfort, and the latter of such measures as are designed to effect the permanent closure of the abnormal aperture.

Frequent ablutions and injections with cold water, either simple or medicated, and the occasional use of chlorinate of soda, will prevent excoriations and feter, and a proper regulation of the diet, with a soluble condition of the bowels, will go far in preserving the general health, which, under opposite circumstances, sometimes suffers most severely, the patient becoming nervous, dyspeptic, and even hysterical. To guard against the incessant escape of urine, and enable the poor patient to exercise occasionally in the open air, the vagina should be kept constantly filled with a hollow plug, or caoutchouc bottle, enveloped in oiled silk, and furnished with a tube and stopcock, in order that it may be inflated or emptied at pleasure.

The radical cure of vesico-vaginal fistule may be effected by cauterization, incision, and suture. Cauterization of the edges of the fistule is applicable, as a general rule, only in cases of recent standing, and where the opening is very small. Under such circumstances, complete and permanent cures have occasionally been effected, but the remedy requires frequent repetition and the utmost perseverance to insure success. It may be effected by the actual or galvanic cautery, or by the acid nitrate of mercury, applied, at first, every fourth day, and afterwards once a week or fortnight, the object being merely to excite the granulating process.

Incision has occasionally been employed successfully. The operation is, of course, applicable only when the cleft occupies the neck of the bladder, and is unattended with any material loss of substance. Under such circumstances, the urethra should be divided through its entire extent from before backwards, and the parts then treated as in ordinary fistule.

The method by suture, although subject to frequent failure, is far preferable to any other, and should, therefore, be studied with great care and attention. Its origin is generally, and perhaps correctly enough, ascribed to the celebrated Dutch surgeon, Roonluuze,¹ who flourished in the seventeenth century, and ac-

¹ Heebkonstige Anmerkingen, Amsterdam, 1663.

quired much distinction in the treatment of the diseases of the genito-urinary organs. It does not comport with the scope of this work to enter into a history of this plan of treatment, or to speak of the various modifications which it has undergone in the hands of different practitioners; suffice it to say that the operation, as practised at the present day, was first performed, in May, 1833, by Mr. Gossett,¹ Surgeon to Newgate, London, for a fistule the result of vaginal lithotomy. Three gilt wires were inserted and twisted, and an elastic catheter retained in the bladder. The case, however, failed to attract attention; and it was reserved to Dr. Sims, in 1852, to place the operation on a secure and scientific foundation. Dr. Bozeman is also entitled to great credit in this direction; but the operation of Dr. Sims, based as it is upon numerous original trials, and the invention of highly ingenious instruments, is deserving of the greatest praise, and justly entitles that distinguished surgeon to the thanks of the profession, and the gratitude of the class of sufferers for whose benefit it was devised.

Before any operation of this kind is undertaken, I deem it to be a matter of paramount importance to subject the patient to a certain amount of preliminary treatment. Without this precaution, failure, not success, will be likely to attend our efforts. The treatment need not be protracted, but it should be thorough, both as it respects the parts and the system at large. The most absolute recumbency and cleanliness should be observed; the vagina should be frequently syringed with cold water; cold cloths should be kept constantly upon the vulva; the bowels and secretions should be properly regulated; the diet should be perfectly plain and simple; and large quantities of bland drinks should be used to dilute the renal secretion, and deprive it of its acrimony. If the woman be plethoric, blood should be taken from the arm, or from the vulva, perineum, groins, and thighs, by means of leeches.

If the parts be unduly inflamed, they should be touched, every other day, with solid nitrate of silver, until this symptom has measurably disappeared. Any contraction that may exist in the vagina must be divided and permitted to heal over a plug. The evening before the operation a brisk purgative is administered

¹ London Lancet, Nov. 29, 1834.

to clear out the alimentary canal, and, on the following morning, a full opiate is exhibited to keep the bowels quiet.

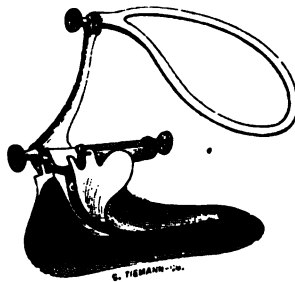
In performing the operation, the first thing to be attended to is to obtain a full view of, and ready access to, the affected parts. For this purpose, the anæsthetized patient is placed on her knees and elbows at the edge of the bed upon a firm hair mattress, protected by a piece of oil-cloth and a folded sheet, the nates being elevated by pillows laid under the abdomen, and the head and shoulders supported by a single pillow. The thighs, separated about eight inches, should form a right angle with the bed. The flexed legs are now confided to assistants, who, at the same time, pull the nates upwards and outwards, the tips of the fingers resting on the labia. The speculum of Sims, fig. 90, or the self-retaining instrument of Emmet, fig. 91, being next introduced,

Fig. 90.



Sims's Speculum.

Fig. 91.



Emmett's Speculum.

the vagina is widely dilated, and the fistule brought completely into view. In addition to the precautions already described, it is necessary to have a strong northern light; but when this is not sufficient, a small mirror may be used, the reflection of which will generally make everything distinct, and enable the surgeon to proceed without any embarrassment from this cause.

The second stage of the procedure consists in bevelling the edges of the fissure at the expense of the mucous membrane of the vagina, the amount of substance removed depending upon the degree of induration, but, in general, averaging from one-third to half an inch, so as to form an ample surface for approximation. If the opening is circular, unusually large, or longi-

tudinal, the edges should be removed in such a way as to admit of being brought together transversely, otherwise complete union may not be effected. The instruments required for paring the fistule, represented in figs. 92, 93, 94, 95, and 96, are a delicate

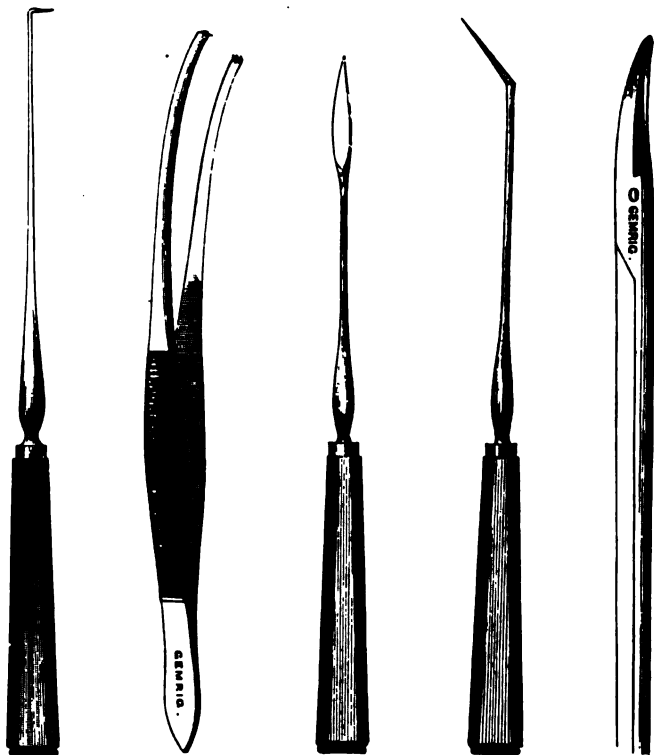
Fig. 92.

Fig. 93.

Fig. 94.

Fig. 95.

Fig. 96.



tenaculum and long, slender, toothed forceps for holding the edges, and a straight and angular knife, made for the right and left hands, as well as a pair of scissors, with very short blades, slightly curved on the flat, for removing the mucous membrane. The lower border of the fistule is pared first, and this is done most easily by transfixion with the straight knife. For refreshing the upper border, the curved knife or scissors will be found more convenient. When the fistule is seated high up in the vagina, the harpoon, or pronged guide, of Mr. Bryant,¹ which is

¹ Guy's Hospital Reports, ser. 3, vol. xi. p. 259.

made of various sizes and shapes, will answer an excellent purpose, as it insures accuracy in the width, length, and evenness of the incisions. The extent of the surface to be vivified having been mapped out by a scalpel, the prongs of the guide, suppos-

Fig. 97.



Bryant's Instrument for Paring the
Edges of the Fistule.

Fig. 98.



Needle Holder.

Fig. 99.



Hook for mak-
ing Counter-Pres-
sure.

ing the upper border to be the one operated on, as in fig. 97, from Bryant, are inserted at the edge of the mucous membrane of the bladder, and passed between the tissues beneath the vaginal mucous membrane, and brought out at the line of the preliminary incision, when the tissues thus included are pressed down upon the base of the prongs with a blunt hook, and removed by carrying the knife in close contact with its posterior surface. In denuding the edges of an unusually large fistule, the operator is sometimes embarrassed by the protrusion of the vesical mucous membrane; but the obstacle may usually be overcome by returning the folds, and inserting a soft sponge into the opening until all the stitches are inserted.

In excising the tissues, there must necessarily be some bleeding, though this is seldom sufficient to cause any annoyance or serious delay. The best contrivance for clearing away the blood

is a sponge mop, the gentle pressure of which upon the lips of the wound, aided, if necessary, by the application of bits of ice,

Fig. 100.



Introduction of Sutures.

Fig. 101.



Suture Carrier.

Fig. 102.



Suture Adjuster.

is quite sufficient to arrest any hemorrhage.

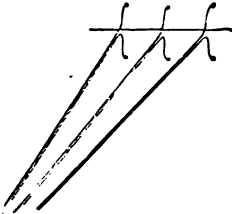
The third step of the operation consists in introducing the sutures, which should be of silver. The instruments required for this purpose are several armed needles, of the pattern of those of Mr. Lister for carrying metallic threads, at least an inch and a half long; the needle-holder, represented in fig. 98; the long forceps, and a blunt hook, fig. 99. The parts having been steadied by the toothed forceps, the first suture is passed through the centre of the opening, by entering the needle at least one-third of an inch below the lower edge of the pared fistule, and bringing it out at the mucous membrane of the bladder, without including it. It is then carried across the opening and entered at the lower edge of the upper border and brought out at the same distance through the mucous membrane,

its passage from within outwards being facilitated with the blunt hook, as in fig. 100. The remaining sutures are inserted in the same manner, the number necessarily varying according to the extent of the fistule. The interval between each two, however, should be three-sixteenths of an inch.

An excellent substitute for the needle and holder for introducing the stitches, is Dr. G. S. Bryant's modification of Starten's canulated needle, shown in fig. 101.

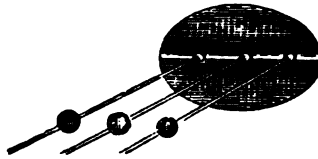
The arrangement of the wires, and the closure of the fistule constitute the last stage of the operation. To effect these objects, the ends of the central wire are passed through the hole of the adjuster, fig. 102, and firmly held between the thumb and forefinger, and drawn upon while the instrument is slipped down and well pressed against the parts. The remaining sutures are dealt with in the same way, so as to insure accurate contact of the raw surfaces, as represented in fig. 103. The wires are then twisted together, or they are fixed by firmly compressing perforated shot on them at the line of adjustment, and clipping off the ends close to each.

Fig. 103.



Adjustment of the Sutures.

Fig. 104.



Bozeman's Button Suture.

With a view to give steadiness and support to, and prevent inversion or eversion of the edges, Dr. Bozeman makes use of a leaden button, the concave surface of which rests in contact with the vesico-vaginal septum, where it is secured by shot. Fig. 104 represents the apparatus previous to its final adjustment.

At the conclusion of the operation, the vagina and surrounding parts having been cleansed of blood, the patient is put to bed, and a Sims's catheter, fig. 105, inserted into the bladder, a gum tube having previously been attached to its proximal extremity, in order to conduct the urine into a bottle placed between the thighs.

Certain modifications of this procedure are frequently demanded on account of the situation or extent of the abnormal opening.

When the fistule is seated in the urethro-vaginal septum, the operation is very easy of execution; but as the parts are thin, and liable to give way from the pressure of the catheter, a long, very concave button, notched at its extremity, where it extends forwards in front of the urinary meatus, will afford the desired support. The catheter, which should be of gum-elastic, is introduced before the sutures are adjusted.

In vesico-uterine fistule, in which the communication exists between the bladder and neck of the uterus, and the urine escapes at the mouth of the latter organ, the anterior lip must be slit up until the aperture is brought into view, when its edges are denuded, and the entire wound closed in the usual manner, as represented in fig. 106.

It sometimes happens that the vesico-vaginal septum is destroyed almost from one extremity to the other, leaving an opening which it is impossible to close by the ordinary operation. In such an event, which is well represented in fig. 107, from Sims, the vagina will have to be obliterated by the free paring of the labia; or, what is still better, its upper portion and the bladder converted into a common cavity. For this purpose, the vesico-vaginal septum, a, and the posterior wall of the vagina, c, are thoroughly denuded, and approximated by silver sutures. The menses escape by the urethra, and, although the patient is rendered incapable of impregnation, this procedure is the only means of making her comfortable. In some cases, however, in which the destruction of the parts is less extensive, the size of the opening may be materially diminished by dragging down the uterus with forceps, daily, for several weeks, as suggested by Bozeman, and uniting its anterior lip

Fig. 105.



Sims's Catheter.

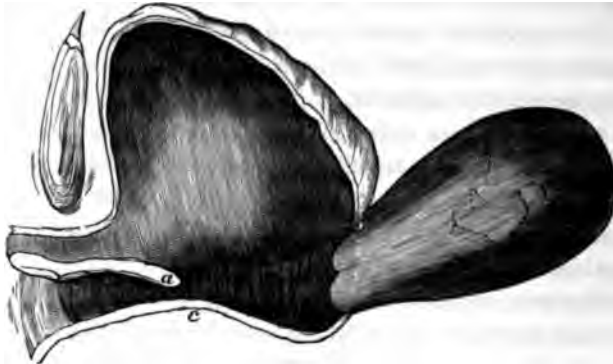
Fig. 106.



The Cervix slit up to Expose the Fistule above, with the Sutures in Position.

with the vesico-vaginal septum. Should the posterior lip have to be used for this purpose, as occasionally happens, the neck of

Fig. 107.



Case of Vesico-Vaginal Fistula requiring Obliteration of the Vagina.

the organ will have to remain imprisoned in the bladder. Similar procedures are required in cases of vesico-utero-vaginal fistules.

Much of the success of this operation, and, indeed, every other of a similar kind, will depend upon the after-treatment. As soon as the patient is put to bed, she should take a large anodyne, for the twofold purpose of allaying pain and inducing quiescence of the bowels, which should not be disturbed under ten, twelve, or fifteen days. The diet should consist exclusively of animal broths, potato, bread, crackers, custard, rice, milk, and tea, with water as the common drink. Opium is given twice a day in as large doses as can be borne; and the patient is never permitted, even for a moment, or for any purpose whatever, to assume the erect posture, though she may if she prefer it lie on either side. The catheter is to be removed as often as may be necessary to keep it clear of mucus and calculous matter; once a day, once every other day, or once every third day, according to the circumstances of each individual case. The vulva and orifice of the vagina should be syringed at least twice in the twenty-four hours with tepid water, a large bed-pan being placed under the nates during each operation to receive the fluid as it runs off.

Undue inflammation is treated on general principles. Both part and system are occasionally endangered by erysipelas. In

a patient under my charge several years ago, although more than usual care had been bestowed upon the preliminary treatment, a most violent attack of this disease took place within a few days after the operation, commencing on the right buttock, and gradually spreading over the upper part of the thigh, perineum, and vulva, from which it speedily extended into the vagina, causing large deposits of lymph, with a strong disposition to cohesion. The constitution suffered very much, and at one time I was not without serious apprehension in regard to the ultimate issue of the case. Notwithstanding all this, however, the woman made a good recovery, although several months elapsed before she fully regained her strength.

Peritonitis has occasionally occurred after this operation, and it is well enough always to have an eye to the possibility of such an event; so that, should it show itself, it may be promptly combated. It will rarely appear before the third day, or after the sixth or eighth.

The sutures should not, as a general rule, be removed before the tenth or twelfth day; if taken out sooner, the adhesions may give way, and thus necessitate a repetition of the operation. The patient being placed in the position already described, and the speculum introduced, the shot are successively seized with the forceps and drawn from the parts, so as to bring the wires into view, when they are clipped with the curved scissors, withdrawal being assisted by supporting the loops on their distal side. The patient, instead of sitting up or walking about, observes the recumbent posture for several days longer, and the use of the catheter is continued until there is reason to believe that the new cicatrice has acquired sufficient strength to resist the pressure of the distended bladder and the traction of the surrounding parts.

Of 204 cases of this operation, recorded by Bozeman, Brown, Simon, and Agnew, 18, or 1 in every 17, proved fatal.

SECT. II.—VESICO-RECTAL FISTULE.

Under this head are included abnormal openings between the bladder and rectum, and between the latter tube and the urethra. The lesion may be produced by numerous causes, of which the most common are incised, punctured, and gunshot wounds,

ulceration, abscess, or malignant disease. It is sometimes a result of stricture of the urethra; and it may also be produced by the careless use of a metallic catheter or bougie. A calculus, permanently arrested behind the prostate gland, may, by its pressure, induce ulceration, and make its way from the bladder into the bowel, and so occasion the affection in question.

The characteristic sign of rectal fistules is the interchange of the contents of the two contiguous reservoirs, the urine passing into the bowel and the feces into the bladder. In the urethral variety, the urine escapes into the bowel only during micturition; while in the vesical form, the feces are discharged by the urethra solely during the same act. In consequence of this occurrence, the parts are apt to become sore and irritable from the contact of substances which are entirely foreign, and, therefore, injurious to them. Moreover, the constant introduction of fecal and other matter into the bladder is liable to give rise to calculous concretions and to retention of urine. Effects similar to these may result from a fistulous communication between the bladder and the ileum or the bladder and the colon; doubt may also arise, under such circumstances, as to the actual location of the opening. When this is the case, a careful examination with the anal speculum, aided with a slender catheter, very conical at the point, will generally enable us to arrive at a correct decision respecting the real nature of the lesion.

Vesico-rectal and urethro-rectal fistules, however induced, will often disappear of their own accord. In all cases, the greatest attention should be paid to the rectum, which should be kept constantly free from fecal matter, the ingress of which into the bladder and urethra is a source of so much mischief and suffering. For this purpose, especially in the traumatic form of the lesion, the bowels should be maintained, for days together, in a perfectly quiescent state by opium, and the rectum should be washed out several times in the twenty-four hours with cold water, or, if the discharges be fetid, with a very weak solution of chlorinate of soda. The recumbent posture should be carefully observed; the diet should be of the most bland and simple character; and drinks of every description should be used as sparingly as possible. As the case progresses, the closure of the fistule, particularly in the urethral form of the affection, may often be greatly promoted by the frequent withdrawal of

the urine with the elastic catheter, thereby preventing the contact of that fluid with the abnormal opening. In a case of this description, the result of acute prostatic abscess, Sir Henry Thompson¹ effected a cure in three months by making the patient micturate in the prone position. When nature fails to accomplish her purpose, a cure may not infrequently follow the use of nitrate of silver, acid nitrate of mercury, or the galvanic or actual cautery, applied through the intervention of an anal speculum.² In very obstinate cases, especially when the abnormal opening is situated very low down, the edges may be pared, and united by suture, as in vesico-vaginal fistule; the parts being previously dilated by the bougie, and widely opened at the time of the operation by means of blunt hooks. When this proceeding does not afford the requisite room, it would be perfectly proper, as a preliminary step, to paralyze the sphincter muscle by overstretching its fibres with the thumbs.

When the fistule has been caused by the operation of lithotomy, it will generally close spontaneously, but should it fail so to do, I would hesitate a good deal before I would divide the parts, as has been recommended by different surgeons. The worst forms usually of this accident are those which follow the recto-vesical section, and here the knife may occasionally be used with advantage.

A very remarkable case of vesico-vagino-rectal fistule came under my observation, upwards of twenty years ago, in a woman, twenty-seven years of age, in consequence of protracted labor, during which the bladder was permitted to remain distended for the first three days. As a result of a violent inflammation of the vagina, that passage, as well as the urethra, was completely obliterated. For the first twelve months after the accident, the urine dribbled off constantly by the anus; but, after that period, she was able to retain it for half an hour, or even an hour, especially when she was in the erect posture. The rectum, which thus served the purpose of an accessory receptacle for the urine,

¹ Holmes's System of Surgery, vol. iv., 2d ed., p. 986.

² In a man, nearly sixty years of age, the editor succeeded, in 1868, in closing an aperture between the prostatic urethra and the rectum, of the size of a small quill, by the application of a cylinder of silver, previously dipped in strong nitric acid, and drawing off the urine every six hours. The parts were touched only three times, and in ten days the cure was perfect.

was unusually tender and irritable, while the anus constantly exhibited an inflamed and excoriated appearance. The orifice of the urethra was natural, but all attempts to pass an instrument proved abortive.

Finding it impossible to restore the obliterated vagina, I introduced a large curved trocar into the urethra, for the purpose of reëstablishing the natural channel for the urine. By wearing a self-retaining catheter for several weeks, the canal was completely restored to its former size, the urine being discharged in a full stream, and not oftener than once every four hours. She had, in fact, the most thorough control over the bladder, and not a drop of urine escaped by the anus.

CHAPTER XV.

MALPOSITIONS OF THE BLADDER.

SECT. I.—HERNIA OF THE BLADDER.

THE bladder, like the other abdominal viscera, is liable to protrude from the pelvic cavity, constituting what is denominated a cystocele. The protrusion may take place in different regions, the principal of which are the inguinal, the femoral, and the vaginal, the latter of which is its most common seat; while it is rare in the perineum and pudendum. Verdier saw a case where the bladder with the urachus and umbilical artery was drawn down into the scrotum. A distended bladder has occasionally descended before the head of the child in labor; and an instance is recorded by Merriman, where a tumor thus formed was actually opened under the supposition that it was a hydrocephalus.

A hernia of this description is sometimes complicated with a bubonocoele, or hernia of the groin, which it may either precede or follow. In those enormous abdominal ruptures, in which a large mass of the intestinal tube is protruded, the bladder occasionally forms a constituent part of the tumor. On the other hand, the bladder sometimes descends first, and thus paves the way, as it were, for the escape of the bowel. A very interesting fact is the occasional coexistence of stone in the protruded organ. Of this occurrence, examples are mentioned by Rousset, Ruysch, Tolet, Paget, Barlow, and others. One of the most interesting, in a practical point of view, is that recorded by Sala, in which the patient had all the symptoms of stone, although none could be felt by the sound. After death, the foreign body was found in the bladder, which was contained in the groin. In a case reported by Petit, the calculi, which were several in number, were discharged by the urethra. Hartmann has recorded an instance in which a pudendal cystocele contained a stone weighing three ounces.

Hernia of the bladder occurs in both sexes, and at different

periods of life. A case is related by Pott of a boy of thirteen. The occurrence, however, is most common in elderly male subjects who have been repeatedly afflicted with retention of urine. Of the exciting causes nothing special is known; but the probability is that they do not differ from those of hernia in general. In women, the affection, particularly that form of it known as vaginal cystocele, has been noticed as an effect of dropsy and pregnancy. In children, it has sometimes been caused by the irritation of stone.

The cystic hernia is destitute of a proper peritoneal sac. The only exception to this rule is where the rupture is of long standing, or the tumor is of great bulk, in which case the fundus of the bladder may drag the peritoneum down into the scrotum, so as to form a hernial sac, into which a portion of bowel or omentum may afterwards protrude. The swelling is always formed, in great measure, by the superior portion of the viscus, and is generally of small size, although occasionally it has been known to attain the magnitude of a fist or of a goose's egg. When the disease is complicated with bubonocoele, the intestinal hernia invariably lies in front of the cystic.

In a case observed by Mr. W. J. Clement,¹ the whole bladder had passed out through the left abdominal ring down into the scrotum, forming an enormous tumor which occupied both the pubic and inguinal regions, and was nearly fifteen inches in length by twenty-nine in circumference. The penis was completely buried beneath the integuments, and the urine was discharged through an opening resembling the navel. The canal through which the protrusion had taken place was traversed by a portion of the colon, and was sufficiently capacious to admit the entire hand. The sac, formed by the bladder, looked like an enormous hydrocele, and contained two quarts of fetid urine, which escaped during the dissection by the rupture of a part which had become red and inflamed before death.

A cystocele is a soft, elastic, and fluctuating tumor, which varies in its size according to the amount of urine contained in the protruded part. It is free from pain, increases from above downwards, attains its volume in a slow and gradual manner, and appears translucent by transmitted light. If the tumor be

¹ Observations in Surgery and Pathology, p. 145. London, 1832.

compressed, it diminishes in size, and the patient experiences an inclination to void his urine. If reducible, it returns during recumbency, but reappears soon after the resumption of the erect posture. If, on the contrary, the parts are adherent, or if the muscular coat of the bladder is paralyzed, the patient cannot expel his urine unless he resorts to compression and elevation of the tumor.

The diagnosis of cystocele is a matter of importance, as a tumor of this kind has occasionally been cut into by mistake. The most decisive symptom is the change which the swelling undergoes in its volume during micturition. As the water flows off, the tumor decreases, or entirely disappears, to recur again, however, as soon as the urine has reaccumulated to some extent in the protruded part. A cystocele has not the doughy, inelastic feel of an omental hernia, nor the soft gaseous feel of an intestinal one, nor does it return with that peculiar gurgling noise which accompanies the ascent of the latter. When the bladder is contained in the scrotum, the disease might be mistaken for a hydrocele, although such an error could hardly be committed except by a careless, superficial observer. Pott¹ cut into such a tumor under the supposition that he was dealing with a diseased testicle; and Verdier² records instances in which the bladder, seated in the groin, was mistaken for abscess or venereal bubo.

The treatment of cystocele, seated in the groin or scrotum, does not differ from that of intestinal hernia. When the tumor is reducible, it should be kept up by means of an appropriate truss; but when the viscus has contracted adhesions, and no longer admits of reposition, the patient must be contented with a suspensory bag. The urine which accumulates in the lower part of the sac must be discharged by raising and compressing the tumor during micturition. If retention should take place, and relief cannot be afforded by the catheter, the part should be punctured. If calculi collect, and become a source of great suffering, they may be extracted by incision of the sac.

In vaginal cystocele, of which I have seen several examples, the swelling is of a globular shape, free from pain, and of a soft elastic feel, imparting, on handling, the sensation of fluid con-

¹ *Chirurgical Works*, vol. i. p. 434. Philadelphia, 1819.

² *Mém. de l'Acad. Roy. de Chir.*, t. ii.

tents. Situated at the anterior portion of the vagina, the tumor varies in volume from that of a pigeon's egg up to that of a fist, and is either contained within the tube, or protruded beyond the vulva. In the more aggravated forms of the complaint, the entire cylinder of the tube is involved. For the production of this affection a certain degree of relaxation of the walls of the vagina is necessary, and hence it is most common in females who have borne many children, or who have suffered a long time under leucorrhœa. I have quite recently seen a case of this affection in a girl of twenty, in other respects apparently quite healthy, except that she always suffered from dysmenorrhœa at her menstrual periods. When the bladder was distended the tumor completely filled the external orifice of the vagina, forming a soft, elastic, white cyst, readily indented by the finger, free from pain, and imparting a distinct impulse under coughing. When I examined it, it had existed for upwards of a year, without a suspicion on the part of the patient of its true nature. When the tumor protrudes beyond the vulva, it forms a translucent sac, not unlike a serous cyst, or the amniotic bag. The diagnosis is determined, first, by the facility with which the tumor is reduced; secondly, by the absence of any opening in its walls; thirdly, by the want of displacement of the uterus; and fourthly, by the fact that the volume of the swelling is greatly diminished by catheterism. An instance occurred in France, in which a protrusion of this kind was mistaken by a medical practitioner for a prolapse of the uterus. A pessary was actually forced through the vagina into the bladder, where it was allowed to remain five months, causing the most violent suffering. It was finally extracted through the fistule, but not without the greatest difficulty and pain. Such an error is as inexcusable as it is disgraceful.

For the relief of ordinary vaginal cystocele, the principal remedies are, the frequent withdrawal of the urine, injections of cold astringent lotions into the vagina, the use of a well-constructed pessary, and rest in the recumbent posture. The general health must be improved by laxatives, light but nourishing diet, and the use of chalybeate tonics.

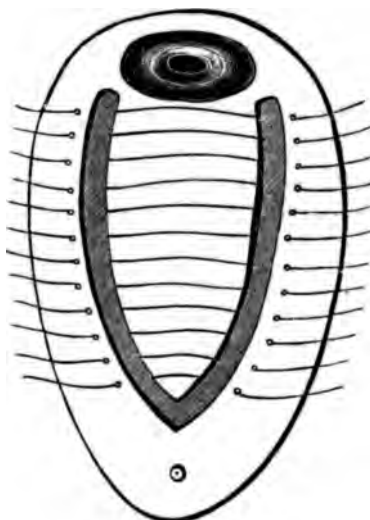
In the more rebellious forms of the affection, attended with inordinate dilatation of the vagina, the operation of elytrorrhaphy, the objects of which are to produce diminution of the capacity

of the vagina and afford support to the displaced bladder, may be performed, the process of Sims, represented in fig. 108, being the one usually adopted. The anæsthetized patient being placed on her left side, and Sims's largest speculum introduced, a curved tenaculum is inserted into the neck of the uterus, so as to cause a prominent fold in the anterior wall of the vagina, from which a strip of mucous membrane, from one-third to half an inch in width, is removed on each side, with the tenaculum and scissors, commencing several lines above the meatus and terminating at the side of the neck of the uterus, the two raw surfaces exhibiting somewhat of a V-shaped configuration. The edges of the wound are tacked together by wire sutures, retained until they are completely united. The subsequent treatment consists in rest in bed; the retention of the catheter, which is removed and cleansed twice in the twenty-four hours; and full doses of opium to lock up the bowels.

When the above treatment fails, the last recourse, and it is one which is particularly applicable to advanced females, for obvious reasons, is closure of the greater portion of the orifice of the vagina, by paring the labia and uniting them with silver sutures. The operation, which has frequently been performed with a good result, is termed episiorrhaphy.

A vaginal cystocele occasionally interferes with parturition, by impeding the passage of the child's head. The bladder is pushed down by the distended uterus below the arch of the pubes, forming a tumor in the anterior portion of the vagina, which feels like a tense bag, of a globular, ovoidal, or cushion-like shape, and the volume of which ranges, according to the quantity of urine present, between an orange and a large fist.

Fig. 108.



Sims's Operation of Elytrorrhaphy; Sutures in Place.

In some instances the tumor hangs out through the vulva, while in others it lies partly within and partly without the vagina. The protrusion is most apt to take place during the early stages of labor, before the child's head has reached the pelvic cavity, and appears to be produced by the pressure which the descending head exerts upon the upper portion of the distended bladder. As the labor advances, the displaced organ is still farther depressed by the contraction of the uterus, and thus the case progresses until the vaginal passage is sometimes totally occluded.

The symptoms which attend the affection, in this event, are variable. In ordinary cases, there is merely an irritable condition of the bladder, with, perhaps, a frequent desire to urinate, and some difficulty in evacuating the water. Occasionally the patient is harassed with retention, or at one time with retention and at another with incontinence. The recumbent posture usually ameliorates while the erect aggravates her suffering. She also generally complains of dragging pains in the pelvic region, and of uneasiness in the groin and perineum. When the prolapse takes place during labor, the suffering is generally more severe; the desire to urinate is much more urgent and frequent; the patient is wholly unable to pass water; the tumor is very tense and painful; the abdominal muscles contract spasmodically; and there is a most distressing dragging sensation in the hypogastrium, the parts feeling as if they wanted to come away, but could not.

The diagnosis of a vaginal cystocele, complicating parturition, is generally sufficiently easy; nevertheless, cases occur in which, for the want of proper discrimination, such a tumor has been punctured. Chaussier met with an instance in which a large swelling of this kind was mistaken for the head of a child. The patient was in labor, and her attendant was on the point of opening the tumor for the purpose of extracting the child, when the celebrated Frenchman arrived and recognized the disease. A case is mentioned by Dr. Hamilton where the prolapsed bladder was actually punctured, under the supposition that it was nothing but the bag of the ovum; and Merriman, as already intimated, records one where a similar blunder was committed under the belief that the swelling was a hydrocephalic head. These examples, the number of which

might be easily multiplied, are sufficient to show how important it is for the practitioner to have a correct knowledge of this disease. The opening of a prolapsed bladder might readily produce a bad fistule, and even destructive inflammation.

The characteristic signs of the affection are, first, the sudden development of the tumor; secondly, the peculiarity of its situation at the anterior wall of the vagina; thirdly, its soft and fluctuating consistence; and fourthly, its diminution, or effacement under compression, and the desire which the patient feels, when it is thus acted upon, to make water. During parturition, the tension of the swelling is increased during the contraction of the uterus and lessened during its relaxation. Moreover, by introducing the catheter, which, however, is sometimes very difficult, the bladder may usually be completely emptied, and, consequently, the bag made to disappear.

The treatment of this form of cystocele consists in drawing off the urine by means of a male catheter, with the point directed downwards towards the base of the tumor. The common female catheter is not sufficiently curved, and is, therefore, unsuited to such a contingency. The patient lying on her back, with the limbs elevated and separated from each other, the operation is performed during the repose of the womb, lest the pressure of the child's head against the extremity of the instrument should occasion mischief. If catheterism be found impracticable, as it sometimes is, under such circumstances, the accoucheur, introducing several of his fingers into the vagina, waits until the uterine pains go off, and then, pressing against the inferior surface of the tumor, he pushes it upwards behind the pubic bones, and, consequently, towards the superior strait of the pelvis. Held in this situation until there is a return of the pains, there will be no probability of a reproduction of the swelling. Chloroform should be administered to quiet the violent spasmodic contraction of the abdominal muscles.

SECT. II.—INVERSION OF THE BLADDER.

Inversion and protrusion of the bladder at the urethra, in the form of a red, vascular, and highly sensitive tumor, is exclusively confined to the female sex; the great length, peculiar shape, and

narrowness of the urethra in the male not admitting of its occurrence, except, perhaps, in a very partial manner. Two distinct forms of the affection are met with in practice, the complete and incomplete; the former consisting in an inversion of all the tunics of the bladder, while, in the latter, the inversion is limited exclusively to the mucous membrane. The partial variety is much more common than the complete, of which, in fact, only a few cases are on record.

a. The incomplete variety is almost peculiar to infants, in which it usually appears as a florid tumor, rarely larger than a chestnut, between the labia. In a case recorded by Noel,¹ it occurred as a tumor of the volume of a pullet's egg, which hung from the urethra in the form of a very thin, transparent bag, filled with a clear, limpid fluid. The child had been tormented for several days with retention of urine, attended with frequent convulsions. On dissection, the ureters were found to be enormously dilated; and the protrusion to be formed by the mucous membrane of the bladder, which had been separated from the muscular coat of the organ by the gradual insinuation of the urine between them, on account of obstruction to the flow of urine from the ureters. In an example of partial protrusion, mentioned by Hoin,² the tumor, evidently formed, as was supposed by this writer, of the mucous membrane of the neck of the bladder, was nearly of the shape and size of the third phalanx of the little finger. It appeared to have been produced by the violent straining which the patient, a woman, twenty-five years of age, was obliged to make to void her urine, which was frequently retained. It remained several days in the same situation, and finally slipped up of its own accord.

To this variety of the disease belongs the remarkable, if not unique case of Dr. J. Bamberger,³ of a man who was for a long time afflicted with anal fistule, accompanied by a tumor as large as a hen's egg, in the perineum, consequent upon a fall upon this region a number of years previously. He was unable to retain his urine, which constantly dribbled away, and thus greatly aggravated his sufferings. Whenever an attempt was made to

¹ Mémoires de l'Acad. Royale de Chir., t. ii. p. 23. Paris, 1819.

² Essais sur les Hernies, p. 343.

³ Diss. de Intussuscep. Membr. Urethræ Int. ex Prolapsu Ejusdem. Wirceburg, 1795.

pass a catheter, the point of the instrument was invariably arrested by the tumor. An examination of the body revealed the following circumstances. The right ureter, as well as the right pelvis of the kidney, was widely dilated in its whole length, the coats of the bladder were very thick and muscular, and the urethra was greatly expanded for a short distance beyond the bulb, where it was observed to be abnormally narrow. Into this contracted portion projected a fold of the lining membrane of the bladder, in the form of an acorn, with a small opening capable of admitting a silver probe.

The immediate cause of this affection would appear to be a relaxed and weakened state of the mucous membrane of the bladder, attended with great dilatation of the urethra. The exciting causes are violent and frequent straining, such as accompanies various impediments to the evacuation of the urine and feces, and protracted and violent cough.

In the treatment of this form of inversion and prolapse, the circumstances to be mainly attended to are, first, to enjoin strict recumbency, not for a week or month, but for a long time; secondly, to reduce the tumor carefully, and to counteract afterwards any tendency to protrusion by the frequent use of the catheter, and astringent washes and injections; and, thirdly, to correct the general health by chalybeate tonics and other means. The bowels should be maintained in a soluble condition, and the urine should be voided in the recumbent posture, the patient lying on her side or back. Excision of the protruded parts should be studiously avoided, as it might lead to fatal results.

β. Of the complete variety of inversion and prolapse of the bladder, there are, so far as my information extends, only seven well-authenticated cases on record. Of these, the first occurred in the practice of Mr. Percy, by whom it was communicated to Mr. Chopart.¹ The others were met with by Dr. Thomson,² Dr. Murphy,³ Mr. Crosse,⁴ Dr. Lowe,⁵ Dr. Beatty,⁶ and Mr. Croft.⁷

¹ *Traité des Maladies des Voies Urinaires*, t. i. p. 399. Paris, 1830.

² *London Lancet*, vol. i., 1875, p. 46.

³ *London Medical Gazette*, vol. xi., 1833, p. 525.

⁴ *Trans. of the Provincial Med. Assoc.*, vol. xiv., 1846, p. 185.

⁵ *London Lancet*, 1862, vol. i. p. 250.

⁶ McClintock, *Clinical Memoirs on Diseases of Women*, 1863, p. 239.

⁷ *St. Thomas's Hospital Reports*, N. S. vol. ii., 1871, p. 195.

Of these seven cases, the first occurred in a very fat abcess, fifty-two years of age, who was habitually affected with a cough; the second was due to excessive straining from acute cystitis, in a woman upwards of forty; while the remainder were confined to infants between the ages of fourteen months and four years. In the instance of Dr. Lowe the child had been subject to incontinence of urine from its birth; and from the time it was two or three days old the tumor had been observed to protrude during a fit of coughing or straining. The probability is that a congenitally relaxed and weakened condition of the muscular fibres of the neck of the bladder and the urethra is the essential cause of the trouble, and that the inversion takes place during fits of crying, coughing, sneezing, or straining at stool. In all of the cases the urethra was greatly dilated.

The case of Mr. Croft is peculiar from the fact that during the struggles that were made in the examination the bladder gave way at a minute point on its most prominent aspect, followed by the escape of a small quantity of a clear, straw-colored fluid, which responded to none of the tests for urine, and by partial collapse of the tumor. Mr. Croft is of the opinion that the inverted bladder carried its partial peritoneal covering with it, which, becoming constricted by the meatus, poured out a serous fluid. Violent expulsive efforts of the abdominal muscles at last caused the tiny rupture which he witnessed. This, however, did not give rise to any bad consequences.

It is of great moment that this variety of tumor should not be confounded with other affections, as vascular, polypoid, and other growths occurring in this situation. It is evident that an error of diagnosis might be productive of the most serious consequences. In the case of Mr. Murphy, the tumor was mistaken by another practitioner for a prolapse of the rectum, a view in which that gentleman himself was at first inclined to coincide; and it was not until after the most patient and thorough examination, and the detection of the orifices of the ureters, which were brought into view by pulling the swelling gently downwards, that he arrived at a satisfactory conclusion. In the instance of Mr. Crosse, the professional attendant supposed the protrusion to be a vascular tumor, on which account he thought it might be removed by ligature, which he was on the point of

applying, when, fortunately for both patient and himself, the true nature of the malady was detected.

The most important signs, in a diagnostic point of view, are, the presence of a pyriform, red, florid, vascular, soft, elastic, reducible tumor, about the size of a walnut, situated below the clitoris, and between the labia, which may become injected and increase in size on crying or straining; more or less dysuria or incontinence both before and after its appearance; the ureters exposed or rendered visible by gentle traction on the protrusion; and unimpairment of the general health. In making an examination, the patient should always be placed recumbent, with the thighs somewhat flexed on the pelvis, and separated from each other; the pudendal lips should then be held apart, and the tumor carefully inspected at its point of attachment, which is always comparatively narrow, and appears as if it were prolonged into the urethra. A polypoid or papillary tumour, or sarcomatous growth, affections which are liable to occur in this situation, may usually be easily distinguished by their history, by their comparatively firm consistence and solid feel, by their irreducibility, by the presence of the urethra in front of the tumor, and, finally, by the character of the accompanying local distress, which is sometimes very severe, and may, if persistent, seriously undermine the general health.

In the reduction of the tumor, the patient is placed upon her back, the head and shoulders are elevated, and the thighs, flexed upon the pelvis, are widely separated from each other. The labia are then held apart by an assistant, while the surgeon applies his fingers, previously oiled, to the surface of the tumor, and pushes up that part of it first which came down last, the pressure being maintained steadily but gently until the whole of it has slipped up behind the pubic symphysis. When the swelling is bulky and of long standing, it may be necessary to assist these efforts by means of a catheter applied to the fundus of the bladder, and carried up in the direction of the urethra, as was done so successfully by Dr. Murphy.

When the parts are restored, the patient should be obliged to observe, for some time, the recumbent posture; the urine should be drawn off several times a day with the catheter; and, if the tendency to protrusion be considerable, a compress, confined by a T-bandage, should be worn upon the orifice of the urethra.

When the patient gets up, she should wear an abdominal truss, to afford tone and support to the hypogastric region.

In view of the loss of tone of the muscular fibres of the neck of the bladder and the urethra, faradization should first be resorted to ; but when the urethra is much dilated, and there is persistent incontinence of urine, an operation may become necessary for the purpose of diminishing its calibre. The inferior portion of the tube may be divested of its mucous membrane, after which the raw surfaces may be approximated by several points of the interrupted suture, care being taken to draw off the urine several times a day until the consolidation is perfected. To effect the same object, Dr. Lowe applied the actual cautery five times in eleven months. There was no relapse of the affection ; but slight incontinence remained.

CHAPTER XVI.

MALFORMATIONS AND IMPERFECTIONS OF THE BLADDER.

MALFORMATIONS of the bladder are rare, and, with two exceptions, in a practical point of view, not very important. They may be arranged under the following heads: 1. Absence of the bladder; 2. Bilobation, or multiplication of the organ; 3. Extrophy, or congenital eversion; 4. Patent urachus.

SECT. I.—ABSENCE OF THE BLADDER.

Absence of the bladder has been observed only in a few instances; but when the defect exists, the ureters open into the rectum, the urethra, the vagina, or in the vicinity of the navel. Nauche¹ has recorded an instance of the last occurrence, and, still more recently, Mr. Buck² has described the case of a person who passed for twenty-three years as a female, in which there was a congenital malformation of the penis, scrotum, testes, and pelvic bones, and a complete absence of the bladder, the urine constantly escaping at an ulcerated point, which corresponded to the umbilicus, by two small apertures which denoted the openings of the ureters.

When the ureters terminate in the rectum, the part is converted into a true cloaca, as in birds and reptiles. Richardson has published, in the seventh volume of the Philosophical Society of London, the history of a youth who lived seventeen years without ever having urinated by the penis. He passed all his water by the anus, and the only inconvenience which he experienced was a slight but persistent diarrhœa. Haller³ cites several examples of the insertion of the ureters into the vagina.

A singular case of this deficiency was observed some years ago, by Dr. B. J. Raphael, of New York. The subject was a full-grown, healthy-looking infant, which, at birth, presented the

¹ *Maladies de la Vessie*, p. 9.

² *London Lancet*, vol. ii., 1860, p. 564.

³ *Element Physiol.*, t. vii. p. 297.

following appearances. There was a tumor, about the size of a hen's egg, at the umbilicus, which evidently contained intestine, and which could be easily reduced, but always returned the moment that the pressure employed for that purpose was discontinued. The anus was imperforate, the testes had not descended, and the penis and scrotum existed merely in a rudimentary state. The posterior fontanelle was absent. The child died at the end of nine days. On dissection, the tumor above mentioned was found to contain nearly the whole mass of the small intestines, which were adherent to each other, and terminated in the umbilical sac, where there was a discharge of meconium through an opening made by ulceration. The entire colon was wanting. No trace of a bladder could anywhere be detected. The left kidney occupied the usual position, but the right was situated in the right side of the pelvis. Both ureters terminated in the sac containing the small intestines. The sacrum was very broad, and filled up the space between the branches of the ischiatic bones, while the coccyx was prolonged forwards to an unnatural extent, and thus served, along with the bones just mentioned, to form the anterior wall of the pelvis, the pubic bones being absent.

A few instances are related in which the ureters were directly continuous with the urethra. Of these, one of the best authenticated is that of Binniger,¹ who observed it in the body of Abraham Clef, which he examined in the presence of several surgeons. The bladder was totally wanting. A probe introduced into the urethra could be readily passed alternately into the ureters, and from the ureters into the urethra; thus proving, beyond all doubt, that there was no intermediate sac. The kidneys were unusually large, and free from calculous concretions, although Clef had voided one some time before his death. Schmidt² met with a case of absence of the bladder in a female thirty-two years of age, who suffered from incontinence of urine since her twelfth year. The right ureter opened at the meatus. Fleury³ has also quite recently recorded the case of a girl who had menstruated for two years, in which the ureters terminated in the cul-de-sac of the urethra which was an inch and a half long.

¹ Obs. Med., t. 2, c. 2.

² London Lancet, vol. i. 1860, p. 323.

³ Gaz. Hebdomadaire, No. 6, 1874.

SECT. II.—BILOBED BLADDER.

The bladder has been found divided into two or more compartments, the result of a congenital defect. The anomaly is exceedingly rare, the great majority of reported cases of double or multiple bladders being merely instances of sacculations from disease. In the latter event the muscular tunic does not enter into the composition of the supplementary organ. The internal septum upon which this arrangement depends is generally situated transversely, but occasionally it is directed obliquely, or even vertically. Of the latter variety an interesting example is recorded by Blasius.¹ The bladder of a man who died of phthisis was divided in the direction of its length into two equal portions, by a septum which extended from the superior part of the reservoir to its neck. Each compartment had a distinct ureter. Frank² met with a similar instance. During life, a tumor was perceptible on each side of the linea alba, both of which disappeared on micturition. An extraordinary example of bipartite bladder is reported by Angelo Scarenzio.³ A young man, nineteen years of age, with hypospadias and cleft prepuce, had undergone six lithotomy operations, when, in consequence of the impaction of fragments of the stone, he was subjected to lateral lithotomy six months after the first sitting. Death resulting at the expiration of two months, the bladder was found to be divided by a longitudinal septum, which was the seat of an opening through which the two halves communicated.

In a man, fifty-eight years of age, Professor Scibelli,⁴ of Naples, found a triple bladder. The supplementary organs, which were well provided with a muscular tunic, and were continuous with the ureters, communicated with the normal bladder by two openings seated in its right lateral wall.

Mr. Beach,⁵ in the case of a girl, five years of age, met with a bladder containing a pouch opening into a third ureter, which communicated with the enlarged right kidney by a cavity with

¹ *Observ. Med. Rarior*, Cum. Fig. ob. 19.

² *Seydel. Arch. der Heilkunde*, 1865, p. 385.

³ *Annali Universali di Medicina*, 1860, and *Gurlt's Jahresbericht für 1860*, 1861, p. 414.

⁴ *Med.-Chir. Rev.*, Oct. 1864, p. 328.

⁵ *Trans. Path. Soc. London*, vol. xxv. p. 185.

smooth walls, but shut off from the remainder of the kidney. A still more remarkable example of malformation, however, is recorded by Molinetti.¹ Here the individual, a female, had five bladders, five kidneys, and six ureters, of which two were inserted into the largest reservoir, while the remainder terminated each in one of the small sacs, which discharged their contents by special ducts into the main organs. This extraordinary number of bladders was the result altogether of an original vice of formation and not of disease.

A case of congenital malformation of the bladder, of a very singular and unusual character, was published some years ago by Dr. C. P. Johnson,² Professor of Anatomy and Physiology in the Medical College at Richmond, Virginia. It occurred in a male child, eight months of age, who had suffered for several weeks previously to his death from violent paroxysms of pain in the hypogastric and umbilical regions. The chief point of interest was an abnormal pouch, which, arising by a narrow pedicle from the lower and back part of the bladder, at the place naturally occupied by the right seminal vesicle, passed along the posterior wall of the bladder, about two inches above its upper border. It was about ten lines in diameter, of an irregularly cylindrical shape, hollow, and of the same structure as the bladder, with which it communicated by a small aperture just within and below the orifice of the right ureter. The pouch, at the time of the dissection, was found to be filled with urine. The bladder was of the natural size and form; and the prostate gland, the left seminal vesicle, and the two ureters occupied their usual position.

SECT. III.—EXSTROPHY OF THE BLADDER.

By far the most frequent and distressing malformation of the bladder, is exstrophy or congenital extroversion, a condition which consists essentially in a fissure of the anterior wall of the viscus and a hernial protrusion of its posterior and lower part through a deficiency in the linea alba below the navel and between the straight muscles of the abdomen, reaching

¹ Diss. Anat. Path., lib. 6, cap. 7.

² Medical Examiner and Record of Medical Science, July, 1850, p. 381.

as low down as the genital organs. The affection, which takes place during the fourth week of foetal life, and is due to a want of union of the allantois, is met with in several degrees of severity, so that it may be regarded as partial or complete, in accordance with the extent of the coexisting defects in the pubic bones and the genital apparatus. In the milder grades, the umbilicus is well formed, and the cleft in the abdominal walls is so slight that a more or less extensive strip of integument exists between that protuberance and the upper limit of the protrusion. In other cases, the urethra and genital organs are normal, and the symphysis is present, although it is membranous and delicate, as in those recently reported by Dr. Cheever¹ and Dr. Bigelow.² In another class of cases, and they are still less severe than the preceding forms, the bladder is only cleft at its

Fig. 109.



Exstrophy of the Bladder. *a.* Everted bladder. *b, b.* Orifices of the ureters. *c.* Penis without urethra. *d, d.* Pubic symphysis. *e.* Scrotum and testis. *f.* Congenital inguinal hernia.

upper portion, and its posterior wall protrudes above the pubes, the genitals, the urethra, and pubic symphysis being perfect. In the complete form of the affection, of which a good representation is afforded in fig. 109, taken from a patient upwards of

¹ Boston Med. and Surg. Journ., Feb. 11, 1875.

² Ibid., Jan. 6, 1876.

twenty years of age, the pelvis is deformed, and the genito-urinary apparatus is in a more or less rudimentary condition.

The protruded bladder presents considerable diversity both as it respects its form, size, and color. In general, it is somewhat ovoidal, or globular; but, occasionally, it is very irregular, or nearly flat. Its volume is greatly influenced by the age and position of the subject. In the child, it rarely exceeds that of a walnut, while in the adult, when it has attained its maximum development, it may be as big as a fist, or a goose's egg. Very small when the subject is recumbent, it becomes quite prominent, from being pushed forward by the abdominal viscera, when he stands up, coughs, sneezes, or exerts himself. The surface of the tumor is of a bright-red color, and is constantly covered with a mucous secretion, which protects it, in some degree, from the injurious impression of the atmosphere. In elderly subjects, the part is sometimes partially invested with a cutaneous pelticle, in consequence of which it is much less sensitive, or irritable, than in infancy, childhood, and adolescence, in which it is generally very tender, and apt to bleed on the slightest touch. The orifices of the ureters, generally situated at the inferior part of the tumor, are usually marked each by a small conical eminence, from which the urine constantly dribbles, rendering the person, even if very cleanly in his habits, uncomfortable to himself, and disgusting to those around him. The distance between the two apertures varies from one to two inches, according to the age of the subject.

In most cases, there is a separation of the pubic bones, or, more properly speaking, an absence of their bodies.¹ The interval between them varies, in different cases, from two and a half to five inches, according to the age of the subject and the width of the pelvis; and is occupied by a strong, dense, ligamentous substance, by which the gap is effectually closed. The pelvis is generally broader and more shallow than in ordinary individuals, and the thighs are usually wider apart. A very common occurrence is inguinal hernia, sometimes on one, and sometimes on both sides.

The penis, always preternaturally short and flattened, is gene-

¹ Cases in which no such separation existed are recorded by Denman, Walker, Coates, Roose, and other writers; but they appear, on the whole, to be rare.

rally bent backwards, and furnished with an imperfect prepuce. The cavernous bodies, attached below to the ischium, as in the natural state, are small and narrow, and are not always united along the middle line, except just behind the head of the penis. This organ is sometimes imperforate, and at other times it presents a gutter along its upper surface for the lodgment of the lower half of the urethra. When this is the case, the posterior part of the canal displays the verumontanum, the mouths of the ejaculatory ducts, and the orifices of the prostatic canals. The prostate gland is generally present, but in a rudimentary state.

The seminal vesicles, always very diminutive, are sometimes represented by two small tubercles. Whatever may be their volume, they are invariably situated behind the inferior part of the tumor. The ejaculatory ducts pursue their natural route, but are unusually small.

The scrotum is sometimes completely absent; at other times it exists merely in a rudimentary state. In the latter case, it may contain the testicles, while in the former, these organs are either lodged in the groins, or in a cutaneous bag at each side of the tumor. The testicles are sometimes normal; at other times, they are diminished in volume, or entirely absent; this, however, is rare.

The rectum is commonly natural, both in its situation and dimensions; sometimes it is considerably dilated, and sometimes, again, it is so much contracted as to give rise to great pain and difficulty in defecation.

The sexual appetite varies in different individuals; being entirely wanting in some, very weak in others, nearly normal in some, and in others, again, so great as to be at times a source of positive suffering. A remarkable instance of the latter peculiarity is given by Dr. Henry W. Ducachet, of New York, in the third volume of the American Medical Recorder. It occurred in a man, aged thirty years, whose testicles were large and well-formed, but the penis was impervious, and not more than an inch and a half in length. He confessed that his venereal desires were frequent and tormenting. Examples of a similar description are mentioned by other writers. The emissions, in most cases, are imperfect, and the erections are generally attended with a sense of uneasiness, if not actual pain. From the small size of the penis, and the peculiar conformation of

the urethra, persons affected with this infirmity are necessarily incapable of procreating the species.

In the female, important changes are noticed in the genital organs. The clitoris may be absent, or it may deviate more or less from the normal standard. It is sometimes situated at one side of the median line, unusually small, cleft, or wanting entirely. The urethra is generally absent. The nymphæ are dis-united, and imperfectly developed; the pudendal lips are either absent, or they are of moderate size, and covered with hair. In the latter case, they extend from the sides of the tumor towards the anus, without uniting, and without forming what is called the fourchette. The vagina usually exists in a rudimentary state; being preternaturally short, narrow, and flattened, with an uncommonly small orifice, which has sometimes the appearance of a transverse slit or fissure. The uterus is sometimes absent, sometimes rudimentary, sometimes fully developed. In the latter case, the subject may menstruate, and conceive, as in the interesting cases recorded by Thiebault¹ and Ayres.² In the male, on the contrary, there must always be complete impotence, on account of the peculiar manner in which the ejaculatory ducts open upon the surface of the tumor.

Exstrophy of the bladder is much more common in males than in females. Of 18 cases that have come under my notice, all, except 2, were males. The late Mr. Henry Earle,³ of London, in a clinical lecture published in 1832, states that, in examining the various authorities upon the subject up to that period, he had found 68 cases, of which 60 occurred in males. M. Isidore G. St. Hilaire, who has carefully examined the question in his *Histoire des Anomalies de l'Organisation*, estimates the difference to be in the ratio of four to one.

Despite their constant discomfort, persons affected with this deformity may live for many years. Head, whose case is well known in this country, and from whom the illustration was taken, is now upwards of forty years of age; and Flajani has recorded a case of seventy.

Exstrophy of the bladder, unless the patient is willing to

¹ *Journal Général de Médecine*, t. xxxiv. p. 178.

² *Congenital Exstrophy of the Urinary Bladder*, etc., New York, 1859.

³ *London Medical and Surgical Journal*, vol. i. p. 159. 1832.

assume the risk of an autoplasmic operation, is utterly irremediable; all that can be done is to palliate the patient's suffering by attention to cleanliness, and by the use of a closely-fitting flexible gutta-percha shield, furnished with a gum-elastic bottle for receiving the urine, as represented in fig. 112. When this cannot be obtained, the part must be kept constantly covered with a thick, soft compress, renewed as often as it becomes wet and disagreeable. The skin around may be protected, if necessary, with pomatum, simple cerate, or zinc ointment.

In the treatment of exstrophy of the bladder the principal objects aimed at are either to establish a channel for the conveyance of the urine from the bladder to the rectum or perineum, or to cover its exposed and sensitive mucous membrane with flaps of skin, thereby protecting it from the contact of the clothing, and preventing excoriation of the surrounding parts, as well as facilitating the adjustment of an apparatus for receiving the urine.

With the view of diverting the urine into the rectum, Mr. Simon, of St. Thomas's Hospital, passed threads from the ureters into the viscus, by which their contiguous walls were strangulated for about half an inch, and a uretero-rectal fistule established two inches above the anus, through which, however, only a portion of the urine passed into the bowel. Some urine continued to flow by the vesical openings of the ureters, notwithstanding two attempts were made to close them with the twisted suture. Violent constitutional symptoms ensued, and for a time the patient, a lad of thirteen, was in great danger; but he survived for nearly a year, when he died of disease of the kidneys and ureters.¹ Mr. Lloyd² and Mr. Athol Johnson³ subsequently attempted to effect the same object by passing a skein of silk through the bladder and the rectum, but both patients died of acute peritonitis, the result of a wound of the recto-vesical pouch of the peritoneum. With a view of avoiding the danger of opening the peritoneal cavity, Mr. Holmes⁴ has suggested throwing the bladder and rectum into a common cloaca, by applying in

¹ London Lancet, vol. ii. 1852, p. 25, and Trans. Path. Soc. London, vol. vi. p. 256.

² London Lancet, vol. ii. 1851, p. 370.

³ Holmes's Surgical Treatment of Children's Diseases, 1868, p. 148.

⁴ Ibid., p. 148.

the two organs, and between the ureters, into which bougies are passed to prevent their closure, the blades of a pair of screw forceps, which are gradually tightened until the intervening tissues are destroyed.

It is very questionable whether these plans to establish a vesico-rectal communication, even if they should be completely successful, would place the patient in a better or more comfortable condition than before. In the case of Richardson, referred to at page 355, in which the ureters opened, as a congenital vice, into the rectum, the urine gave rise to such constant irritation, that the lad suffered from continued diarrhœa. Assuming, however, that the urine could be retained for a short period, its voidance by the rectum is hardly more desirable, or more agreeable, than to pass it in the way usual to such persons.

Early in the present year Dr. Levis,¹ in the case of a boy thirteen years of age, made an attempt, at the Pennsylvania Hospital, to establish a fistulous communication between the bladder and the perineum, and cover in the bladder by a plastic operation. By passing a needle armed with a stout wire through the base of the bladder and behind the scrotum, a track was made, and gradually enlarged by the introduction of bougies until its calibre was half an inch. Through this passage all the urine escaped. A large scrotal flap was then inserted over the bladder, carrying with it the rudimentary penis, which was thus left in the new pouch. Drainage was insured by the retention of a soft catheter, introduced through the artificial urethra. Death ensued on the twelfth day, apparently from the effects of protracted nausea and vomiting.

An operation on a more limited scale, having for its objects the obtunding of the sensibility of the mucous membrane of the bladder and preventing its excoriation, has been practised by Mr. Bryant.² This consists in converting the exposed membrane into a cicatrice by the application of the actual cautery, care being taken to avoid the ureters.

The first attempt to relieve this malformation by covering in the bladder by flaps should be credited to Jules Roux,³ of Toulon, who, in 1853, united a scrotal flap to one drawn down from the

¹ Medical Times, April 1, 1876.

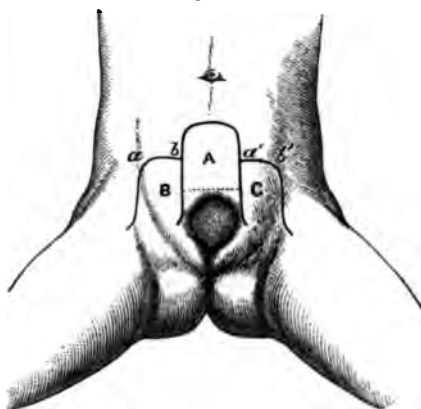
² Practice of Surgery, p. 551.

³ Union Médicale, 1853, 114 and 115.

umbilical region, but both almost entirely perished from gangrene. A short time afterwards, Richard,¹ of Paris, folded an umbilical flap over the bladder, and covered it in by one raised from the anterior half of the scrotum. The man died of peritonitis on the ninth day, but the union of the flaps was almost perfect.

Of the different operations practised at the present day the best, in my judgment, is that of Professor Wood,² of London, for females, and that of Dr. F. F. Maury,³ for males. In the former procedure, represented in fig. 110, from Ashhurst, an um-

Fig. 110.



Wood's Operation for Exstrophy of the Bladder.

bilical flap, A, is reversed over the bladder, the dissection being carried down to within half an inch of the viscus, as indicated by the dotted line, and groin flaps B, C, are brought over the umbilical flap, their upper edges *a b*, *a' b'* coming together in the middle line. In this way the raw surfaces of the flaps are brought in contact, while the inverted one prevents the escape of urine in an upward direction.

In the operation of Dr. Maury, which is an extension of that of Roux, represented in fig. 111, the bladder is covered by a flap taken from the perineum and scrotum, by carrying a curvilinear incision from the outer third of Poupart's ligament across the

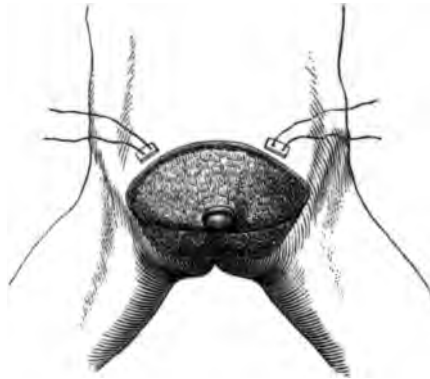
¹ Gazette Hebdom, No. 26, 1854.

² Med.-Chir. Trans., vol. lii. p. 85.

³ Amer. Journ. Med. Sci., July, 1871, p. 154.

middle of the perineum to a corresponding point on the opposite side. This flap is carefully dissected up, to avoid wounding the testicles or herniæ, should the latter exist, until the root of the penis is reached, when that organ is slipped through a small

Fig. 111.



Maury's Operation for Exstrophy of the Bladder.

opening made in the centre of the flap, through which the urine issues without coming in contact with the wound. A curvilinear incision is then carried across the abdomen, and a short flap dissected up for about one inch, under which the scrotal flap, with its cutaneous surface vivified, is slid, and attached by several points of a modification of the tongue and groove suture of Professor Pancoast.¹ In this way, Dr. Maury has succeeded in two instances, not only in forming a covering for the bladder, but also in curing a double inguinal hernia by the contraction of the exposed granulating surfaces. In a third case, in which he performed this operation, sloughing of the flaps occurred.

Professor Bigelow,² of Boston, recently devised a new operation by which the raw surfaces are brought together, without there being any necessity for the formation of an umbilical flap. The exposed mucous membrane of the bladder having been dissected off as far down as the ureters, two lateral flaps, which included both inguinal regions, were united by sixteen silver sutures in the median line and transversely above it. The

¹ Vide Gross's Surgery, 5th ed., vol. ii. p. 360.

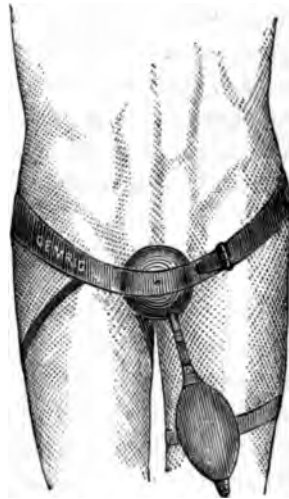
² Boston Med. and Surg. Journ., vol. xciv., No. 1, 1876, p. 1.

patient was a boy of six, and union was solid in about two weeks.

Whatever operation may be practised, the parts should be thoroughly protected afterwards with oiled lint or oxide of zinc ointment, and the patient should be placed almost in a sitting posture, with the knees well supported by pillows to insure relaxation of the abdominal walls. The diet should be nourishing, but unstimulating, and the bowels should be locked up with opium. A properly adjusted urinal, fig. 112, should be worn constantly after the union is perfect, and the utmost attention must be bestowed upon cleanliness, injections of a very dilute solution of nitric acid being used to prevent phosphatic deposit on the hairs.

The first successful plastic operation for exstrophy of the bladder was performed, in 1858, by Professor Pancoast,¹ by lateral groin flaps, the cutaneous surfaces of which were turned towards the viscus. When union and cicatrization of the parts were complete, a very large scrotal hernia of the right side was found to be entirely cured. The patient, a man, twenty-eight years of age, unfortunately died of pneumonia at the expiration of two months and a half. Dr. Ayres, of Brooklyn, nine months subsequently, succeeded not only in covering the bladder, but in establishing the urethra and anterior fourchette of a woman of twenty-eight, who had previously been delivered of a well-developed child. The operation is not, however, by any means devoid of certain risks and dangers, of which the most common are erysipelas and sloughing of the flaps from defective nutrition, and death from peritonitis, pyemia, or exhaustion. Of 53 cases in the hands of Roux, Richard, Lefort, Michel, Maisonneuve, Billroth, Hirschberg, Ruggi, Holmes, Wood, Bryant, Marsh, Durham, Wilkins, Barker, Pancoast,

Fig. 112.



Urinal.

¹ North Amer. Med.-Chir. Review, July, 1859, p 710.

Ayres, Maury, Ashhurst, Levis, Forbes, Bigelow, Cheever, Hodges, and King, 39 were successful, 8 were failures, and 6 were fatal.

A condition, very similar to exstrophy of the bladder, is the protrusion of the entire closed organ through a congenital cleft of the linea alba. In a remarkable example of this malformation, occurring in a lad of eight, and recorded by Dr. Lichtheim,¹ the viscus formed a scarlet tumor, one inch and a fifth in diameter, which was attached to the abdominal deficiency. The pubic bones were separated to the extent of two inches, the intervening space being closed by dense ligamentous tissue. The upper surfaces of the cavernous bodies were cleft, but closed in by mucous membrane, which extended forwards to the contracted meatus. The urine was all passed by the urethra, which pursued its normal course behind the membranous symphysis.

SECT. IV.—PATENT URACHUS.

The urachus sometimes remains pervious for a long period after birth, if not, indeed, during the whole of life. When this is the case, it occasionally forms an outlet for the urine, which is discharged in part or entirely at the umbilicus. The affection, which has been noticed in infants and in adults, is often associated with some obstacle to the free passage of the urine by the natural channel, as abnormal contraction, or complete atresia, of the orifice of the bladder, congenital narrowing of the urinary meatus, imperforate prepuce, or phimosis. It has also been known in this condition to give lodgment to urinary concretions, as in the case of a man, twenty-six years of age, related by Boyer, in which the cavity contained twelve minute calculi.

The umbilical orifice is usually quite narrow, and surrounded by a pale, fungous border, giving the part the appearance of a small tumor, or papillary excrescence. In some cases the opening is contained within the margins of the umbilicus, and is sufficiently large to admit of the insertion of the finger. Occasionally an instrument can be readily passed through the urethra, across the bladder, into the abnormal aperture.

The treatment of vesico-urachal fistule is sufficiently simple.

¹ Langenbeck's Archiv, Bd. xv. p. 471.

In general it is only necessary to remove the exciting cause, as a long, contracted, and adherent prepuce,¹ to enable the opening to close. Whenever there is a urethral obstruction, this should be remedied as a preliminary measure, as in the memorable instance observed by Cabriol,² Demonstrator of Anatomy in the Medical School at Montpellier, in the reign of Henry IV. The subject was a girl, eighteen years of age, who, from the moment of her birth, voided her urine at the umbilicus, which was four inches in length, and resembled the comb of a turkey. The obstruction in the urethra was formed by a thick, firm membrane, which was divided, and a leaden catheter introduced into the bladder, to conduct off the urine, until the parts should be healed. On the following day, Cabriol cast a stout ligature around the projecting portion of the navel, which he then cut off close to the seat of the constriction, the operation being completed by the application of the actual cautery.

The treatment pursued in the above case was as simple as it was successful, and could only be improved by omitting the actual cautery, which was entirely unnecessary.

When the opening is seated between the lips of the umbilicus, the edges of the latter should be freely pared and approximated by several points of the twisted suture, a soft catheter being retained in the bladder to take off the pressure of the urine. A remarkable case, occurring in a man fifty-five years of age, was cured in this way by Mr. Thomas Paget,³ of Leicester, England. The opening in the linea alba was elliptical, and admitted three fingers in its long axis, which was horizontal, and two in its vertical. Fifteen years previously, Mr. Paget⁴ extracted through the open urachus a ring-shaped vesical calculus, which had formed on a hair, and he removed a disk-shaped stone subsequently. The malformation, which had existed from birth, was associated with an umbilical hernia of the volume of a goose's egg, which was greatly diminished in size by the operation.

¹ See case of Dr. Charles, of Belfast, *British Medical Journal*, Oct. 16, 1875, p. 486.

² *Observat. Anatomie*, Ob. 23.

³ *Med.-Chir. Trans.*, vol. xlv. p. 13.

⁴ *Ibid.*, vol. xxxiii. p. 294.

PART II.

DISEASES AND INJURIES OF THE PROSTATE GLAND.

CHAPTER I.

INFLAMMATION OF THE PROSTATE AND ITS RESULTS.

SECT. I.—ACUTE PROSTATITIS.

ACUTE inflammation of the prostate seldom exists as a primary affection, except when it is produced by direct injury. In general, it is altogether of a secondary character, or the result of an extension of disease from the adjacent and associated organs. It is most frequently met with in middle life, when the genital organs are in their full vigor; while it is comparatively rare in childhood and old age, when these organs are either in a state of latency, or ill fitted for the discharge of their functions. The disease, as in other parts of the body, may be idiopathic or traumatic.

The most common existing causes of acute prostatitis are the extension, by continuity of structure, of inflammation of the mucous membrane of the urethra, especially the gonorrhœal, stricture of the urethra, or other impediment to the free flow of the urine, suppression of the cutaneous perspiration, cold applications to the perineum, particularly when the body is overheated, and there is gonorrhœal discharge, or the subject is gouty or rheumatic, direct injury, the rude introduction of the catheter, or the protracted retention of that instrument in the bladder, the passage of fragments of calculi, and irritating applications made to the prostatic portion of the urethra. Venereal excesses, onanism, frequent and prolonged erections, and constant exercise upon horseback, will also occasionally produce the disease, by maintaining habitual engorgement of the gland.

The initial morbid changes met with in this affection are hyperæmia and tumefaction, which depend mainly upon an effusion of serum in the meshes of the connective tissue of the gland, and upon a dilated condition of its capillary vessels. In the more severe forms, there is, in addition, a deposition of lymph, of blood, and even of pus. The latter fluid generally exists in minute, disseminated points, not larger than a pin's head, and of a pale straw color. They are most conspicuous in the connective tissue of the organ, a section of which, when thus affected, bears a tolerably close resemblance to the pulmonary tissues in a state of gray hepatization.

The gland is red, and infiltrated, and, in the advanced stages of the disease, soft and friable. The mucous follicles are enlarged, injected, and distended with a thick, ropy secretion; the excretory ducts, on the contrary, are generally diminished in size, and sometimes even obliterated by the adhesion of their sides. Occasionally they yield, upon pressure, a thin, bloody, and slightly viscid fluid. The fibrous capsule is unnaturally red and vascular, tense, and covered, here and there, with plastic deposits. The size of the gland varies, in different cases, from the slightest increase of the natural bulk to the volume of a walnut, a hen's egg, or an orange. The swelling generally involves both the lateral lobes, although not in an equal degree. The body and middle lobe are also frequently much enlarged. The parts adjacent to the prostate usually participate in the morbid changes.

An attack of acute prostatitis is sometimes sudden and unexpected; at other times gradual, and preceded by symptoms of general indisposition. From whatever cause it may proceed, the first intimation, in general, of its occurrence is pain, with burning, and a sense of weight at the neck of the bladder, soon followed by a frequent and almost irrepressible desire to void the urine. The pain at first is slight, and of a dull, heavy, aching character; but, as the malady progresses, it rapidly augments in severity, and becomes sharp, darting, pungent, or stinging; it is deep-seated, more or less constant, and is increased by the erect posture, by any sudden concussive movements of the body, by pressure upon the perineum and hypogastrium, by defecation and micturition, and by pressure of the finger in the rectum. The pain often shoots along the pubes, thighs, ureters, and sper-

matic cords; and is sometimes exceedingly distressing even in the sacrolumbar region. In the more violent forms of the complaint, and especially when suppuration is threatened, it is throbbing or pulsatile. The testicles are retracted towards the abdominal rings, and a feeling of numbness is experienced in the surrounding parts. The difficulty of micturition, which is usually a prominent feature, even in the early stage of the disease, keeps steady pace with the swelling of the prostate, and is often succeeded by complete retention. The urine is generally scanty, high-colored, dirty, or turbid, and so acrid as to occasion severe scalding or burning as it passes along the urethra. It commonly contains a considerable quantity of mucus, the product both of the affected gland and of the urinary bladder, the inner membrane of which always participates, at an early period, in the morbid action. In some instances, especially in the more violent forms of the disease, blood follows the last drops of urine.

The rectum generally becomes involved, from extension of the original disease, at an early stage of the inflammation. The patient experiences a frequent inclination to go to stool; the parts are exquisitely tender and painful; the feces are voided with much difficulty, and, not infrequently, in a flattened or compressed form; and there is a constant feeling of tenesmus. In many cases, when the disease has existed several days, the bowel feels as if it were stuffed or filled with a foreign body; and, if the finger be introduced into it, the inflamed gland will be found to be exquisitely tender, and to form a tumor which is so large, in some instances, as almost to obliterate the cavity of the tube. If an attempt be made, at this stage of the complaint, to pass a catheter, the instrument will be likely to become arrested by the enlarged organ and to cause severe pain and spasm. Priapism sometimes attends, and occasionally there are involuntary discharges of semen, generally tinged with blood.

These local symptoms are commonly accompanied by well-marked constitutional disturbance. The countenance is flushed; the skin hot and dry; the pulse full, hard, and frequent; the tongue furred, and the appetite impaired. The thirst is commonly urgent; there is excessive restlessness; the bowels are constipated; and not infrequently there is nausea and even vomiting. Delirium occasionally exists, and generally, espe-

cially when attended by rigors, denotes the approach of suppuration.

Acute prostatitis is liable to be mistaken for other affections. Cystitis and stone in the bladder are the diseases with which it is most apt to be confounded. In general, however, the diagnosis is sufficiently easy. The characteristic symptoms are the deep-seated, burning, and throbbing pain about the anus, the gradually increasing frequency in micturition, with diminution of the size of the stream, and pain referred to the head of the penis at the completion of the act, the excessive scalding of the urethra, the feeling of weight and stuffing in the rectum, the constant tenesmus and desire to go to stool, and the flattened form of the feces. When all these phenomena are present, hardly a reasonable doubt can exist in respect to the true nature of the malady, especially if it have supervened suddenly upon external violence or the suppression of a gonorrhoeal discharge. Fortunately, however, the surgeon need not rely upon these or any other symptoms to determine the diagnosis. In all cases he has it in his power to examine the gland directly with the finger and the catheter. With the former of these in the rectum, the prostate, as before stated, can be distinctly felt as a solid, painful tumor, sometimes almost sufficiently large to close the tube and seriously impede the passage of the feces; whilst, if he attempt to introduce the latter into the bladder, he will find it exceedingly difficult, if not impracticable, to succeed, unless he possesses more than ordinary skill in the management of this instrument. The enlargement upon which these obstacles depend is, of course, always more conspicuous after the inflammation has made some progress; in its early stages it is frequently very slight.

In cystitis the prostate is little, if at all, enlarged; there is less pain and tenderness on pressure of the perineum and the rectum; the urine is retained with more difficulty, and is generally voided every few minutes; the lower bowel suffers less, and the patient does not experience the feeling of fulness and stuffing about the anus that he does in inflammation of the prostate. In stone of the bladder, the symptoms are usually less urgent than in either of the other affections, and all doubt about the case generally vanishes under the operation of sounding.

Acute prostatitis is generally rapid in its course. It seldom

continues longer than eight or ten days without tending to resolution or suppuration. When the attack is moderate, or even when it is violent, provided it be combated by prompt and efficient means, it usually ends favorably. When resolution is about to take place, the local distress gradually diminishes, micturition is performed with more facility, the urine becomes more abundant and assumes a lighter color, the fever subsides, and the skin is rendered uniformly soft and moist. The formation of matter is denoted by an obstinate persistence of the inflammatory symptoms, both local and general, by rigors, chills, or shiverings, by violent flushes, by a heavy, throbbing pain in the affected part, by delirium, and, not infrequently, by retention of urine. Idiopathic prostatitis never terminates in gangrene; but this effect occasionally, although rarely, follows the traumatic form of the affection.

Acute prostatitis, being a rapid and highly dangerous disease, must be met with the most energetic antiphlogistic measures. Free depletion by the lancet or by leeches to the perineum and anus is almost always indicated, and should be practised with the least possible delay. If the bowels are overloaded, the venesection is immediately followed by an active purgative, consisting of an ounce of sulphate of magnesia with the eighth of a grain of tartar emetic; or, if there be decided evidence of bilious derangement, of a full dose of calomel and jalap. If much fever be present, accompanied with heat and dryness of the skin, thirst, restlessness, and high arterial action, the patient may at once be put upon the use of the antimonial and saline mixture in union with morphia and aconite, or veratrum viride. Or, instead of this combination, if the activity of the pulse has been moderated by the previous treatment, Dover's powder, or a solution of acetate of ammonia, may be given, aided by tepid demulcent drinks, and the warm bath. The kind of bath is an object of no little importance in the management of this disease. The hip-bath is the one usually recommended; but I am satisfied that its beneficial effects are frequently more than counterbalanced by the inconveniences which attend its administration. All the good effects that can be desired in such cases may be readily obtained from the steam bath, prepared either by conducting the vapor of hot water to the body of the patient from a teakettle, or by placing near him, under the bedclothes, a few

hot bricks, wrapped up in flannels previously moistened with vinegar and water. By either contrivance, free diaphoresis may generally be induced in a few minutes. The perineum, genital organs, and hypogastrium should be kept constantly covered with flannel cloths, wrung out of hot water and laudanum; and the pain and straining should be promptly subdued by the hypodermic use of morphia.

The condition of the bladder is early attended to, and retention of urine, so liable to occur during the progress of the complaint, is promptly relieved with the catheter, a soft, bulbous, elastic one being always preferable for the purpose. As the operation is generally painful, and productive of spasmodic contraction of the parts about the neck of the bladder, it is a good plan to exhibit, a few hours before it is attempted, a full anodyne enema. Absolute rest in the recumbent posture is indispensable throughout the whole treatment; the diet must be of the most bland and simple character; and the drinks must consist of gum water, linsced tea, slippery elm water, and other mucilaginous fluids administered in small quantities.

SECT. II.—ABSCESS OF THE PROSTATE.

Acute inflammation, if unsubdued, occasionally terminates in abscess, which may be seated in any part of the prostate. The

Fig. 113.



middle lobe, however, is less liable to suffer than the rest of the organ, and often escapes entirely, even when the latter is nearly destroyed by it. Occasionally it exists simultaneously at all these points. In the annexed cut, fig. 113, from a specimen in my private cabinet, the abscess was seated in the lateral lobe.

Abscesses of the prostate vary much both in their number and size. Usually, there is only one, while at other times there are as many as six or eight, twelve, or even twenty, scattered through the substance of the organ, and giving it, when their contents are removed, a ridged, cribriform appearance. Under such circumstances it is

not uncommon for several of them to communicate together. When numerous, their dimensions are generally proportionately small, not exceeding, perhaps, the volume of a millet-seed or a pea. A solitary abscess of large size is sometimes seen: I have evacuated one which contained eight ounces of pus.

When the abscess is of long standing, or slow in finding an outlet, it is generally, no matter what may be its size, surrounded by a cyst, of a pale-yellowish color, dense in texture, and from the fourth of a line to a line in thickness. The contents of such a depot do not differ essentially from those of a common phlegmonous abscess in other parts of the body. In general, they are of a light straw color, and of a thick, cream-like consistence, free from odor, and possessed of all the properties of laudable pus. Sometimes, however, they are more or less bloody, or serosanguinolent, and intermixed with lymph, mucus, and the debris of the affected gland. Occasionally, especially when it is long retained, the matter is excessively fetid.

The structures around the abscess are infiltrated with serous and other fluids, more or less softened, and of a brownish or reddish appearance, from the injected condition of their capillaries. When the purulent collections are numerous, they are sometimes entirely disorganized, and converted into a substance closely resembling wet tow. A common and almost a necessary effect of an abscess of the prostate is the formation of a cavity, which is often more serious in its consequences than the abscess itself.

Abscesses of the prostate open in different directions, as the urethra and bladder, the rectum, the perineum, and the peritoneal cavity. The most natural, although at the same time the most unfortunate direction, as it respects the affected structures, in which the collection opens, is into the urinary bladder, or the orifice of the urethra, from which the matter is subsequently discharged along with the urine. Sometimes the abscess points and breaks simultaneously at both these situations. When it is bulky, a large quantity of pus may thus be evacuated at once; or it may drain off slowly and almost imperceptibly. In the former case, the matter may be discharged in a pure state, or it may be mixed with the urine, which will then be of a lactescent, whitish, or grayish appearance, and perhaps more or less offensive; in the latter, the urine will exhibit little, if any, change,

and deposit merely a thin, whitish sediment, visible at the bottom of the receiver. The pus may be evacuated into the rectum, and be discharged either alone or in union with the feces. This mode of communication is by no means uncommon, and is almost certain to occur when the abscess is developed in the posterior part of the gland. The abnormal opening, situated at a variable height from the anal outlet, is generally within reach of the finger, and often continues fistulous a long time, permitting a ready interchange of the contents of the two reservoirs. The disease, in this case, is frequently complicated with inflammation and suppuration of the seminal vesicles and the adjacent structures. In the third place, the pus may escape externally by inducing ulceration of the structures of the perineum. The progress of the fluid is indicated by excessive pain in the part, and by a hard, red, circumscribed swelling, which finally points, and breaks. In some instances the matter escapes into the surrounding connective tissue, and extends upwards to the scrotum and even the penis, following the same course that the urine does when it is infiltrated into the perineum. Finally, the abscess may burst into the peritoneal cavity, at the side or posterior part of the prostate, and so cause fatal inflammation. The occurrence, which is fortunately very rare, is announced by severe pain in the pelvic region, a small, quick, and contracted pulse, violent rigors, and rapid prostration of the vital powers. Death usually occurs in from thirty-six to forty-eight hours.

Such are the various points at which the matter of a prostatic abscess may ultimately find an outlet. Of these the first is, as previously stated, the most natural as well as the most frequent, but also at the same time the most undesirable one, as it involves a greater amount of risk to the patient, from the contact of the urine with the cavity of the purulent depot after the escape of its contents. In this way an additional cause of inflammation is produced, which often operates to the destruction both of the part and the system. The passage of the matter across the perineum is uncommon, and is always attended with great delay and immense suffering, on account of the resistance offered by the fasciæ and muscles in this region. The escape of the pus through the rectum is unfortunate, as it frequently entails an obstinate fistule; but the most disastrous route of all is that in

which the contents of the abscess pass into the peritoneal cavity, and excite fatal inflammation.

This disease occurs at all periods of life, although not with equal frequency. Young men and adults are most prone to it; while it is very rare in childhood and old age. The exciting causes are the same as those of inflammation of the prostate, the most frequent being such as occasion obstruction to the flow of urine. It is not known what influence, if any, is exerted upon the production of this complaint by occupation, season, climate, and other circumstances. It is supposed that senile enlargement of the prostate predisposes to its occurrence. That this view is not without reason is shown from 100 dissections of the prostate after the sixtieth year by Mr. J. C. Messer,¹ in which abscess was met with 5 times in 35 cases of hypertrophy of this organ, once in 20 cases of atrophy, and once in 45 cases in which the gland was normal.

The formation of abscess of the prostate is not always announced by characteristic phenomena, and hence it not infrequently happens that the first intimation which the patient and his attendant have of the real nature of the case is a sudden discharge of pus along the urethra, consequent upon the introduction of the catheter, or a violent effort at micturition. In general, however, when this event is about to take place, there is an increase of all the previous symptoms, both local and constitutional. The pain becomes exceedingly violent, and assumes an aching, throbbing character; there is a sense of weight and pressure at the neck of the bladder; the patient has almost a constant desire to void his urine, which is discharged with much difficulty, and either in drops, or in a small and feeble stream; the urethra is the seat of a scalding or burning sensation; the rectum feels as if it were distended by a foreign body; and more or less uneasiness is experienced in all the associated organs. In some instances the local suffering is of the most agonizing description, depriving the patient of appetite and sleep, and rapidly undermining the vital powers. Complete retention of urine occasionally supervenes. Along with these symptoms there are generally severe rigors, alternating with flushes of heat, intense thirst, excessive restlessness, high fever, and even delirium.

¹ London Lancet, May 19, 1860.

When this combination of phenomena exists, there can hardly be any doubt about the nature of the case, especially if the individual has previously labored under acute or chronic prostatitis. An examination by the rectum will afford additional light, and will often detect fluctuation, more particularly if the matter occupies the posterior part of the gland. At an advanced stage of the complaint, the abscess may point in the bowel, or in the perineum, and thus remove all doubt respecting the diagnosis.

Abscess of the prostate is generally to be regarded as a dangerous affection. The local suffering, if not promptly subdued by a natural or artificial outlet for the pent-up fluid, is of itself sufficient, in many cases, to bring on serious, if not fatal exhaustion. Even under the most favorable circumstances, and where there is apparently little danger from the immediate ravages of the malady, the patient may fall a victim to its secondary effects. One of the worst consequences of this affection is a fistulous communication with the rectum, the urethra, the perineum, or urinary bladder, which it is sometimes impossible to heal, and which renders the individual alike uncomfortable to himself, and disagreeable to those around him. A large abscess is, of course, all other circumstances being equal, more dangerous than a small one, and a number of small ones than a solitary small one. The prognosis, moreover, will be materially influenced by the patient's habits, his age, and his previous health.

In the treatment of this malady the leading indications are, to limit the suppuration, and to afford as speedy an outlet as possible to the effused fluid. To fulfil the first, prompt recourse must be had to depletion, provided this has not been already carried sufficiently far, to antimonials, diaphoretics, anodynes, and emollient applications. Leeches to the perineum and the lower part of the hypogastrium will often prove eminently serviceable, and can seldom be dispensed with.

The second indication is fulfilled by an early artificial opening. If the abscess points towards the perineum, a long, straight, narrow-pointed bistoury should be entered in the raphé about five or six lines above the anal aperture, and thrust directly onwards in the direction of the prostate, which is supported by the finger in the rectum. The incision is enlarged towards the

scrotum, on withdrawing the knife, and its edges are kept apart by a small tent, to prevent premature closure.

When the collection points in the rectum, as will be indicated by the large size and fluctuating character of the swelling, it may be readily reached with a curved trocar, four or five inches long. The patient is placed as in the operation of lithotomy, and the left index and middle fingers, well oiled, are carried up the bowel until they come in contact with the most prominent part of the abscess. The trocar, concealed within its canula, is then placed in the groove formed by the junction of the two fingers, and as soon as it has reached its destination, it is thrust into the swelling, and immediately withdrawn, at the same time that the canula is pushed farther in. When the matter is discharged, the instrument is removed, and the case is treated upon general principles. For some days after the operation, the lower bowel should be kept as quiescent as possible.

When the abscess bulges inwards towards the urethra and the neck of the bladder, it may be punctured with a common silver catheter; or, instead of this, a sound with a conical beak and a small curve may be used. The slightest pressure frequently suffices to effect the object. When the abscess is not yet completely matured, and the local suffering is such as to render delay improper, the operation may be executed with a lanceted stylet. When, by any of these procedures, the matter has been evacuated, the urine should be frequently drawn off with the catheter, to prevent its entrance and accumulation in the interior of the sac. For this purpose the catheter of Mercier, represented at page 114, is preferable, as, in its passage, the beak hugs the roof of the urethra, and is in no danger of entering the sac of the abscess.

SECT. III.—ULCERATION OF THE PROSTATE.

Ulceration of the prostate, as an independent affection, is of infrequent occurrence, and of difficult recognition. It is induced by various causes, of which the principal are, the presence of calculous concretions in the substance of the organ, wounds, or lacerations, whether by accident or the forcible employment of instruments, and the formation and evacuation of abscesses, whether common or tubercular. Of these, the first and third are doubtless the most common.

The symptoms which accompany ulceration of the prostate are such as indicate the existence of chronic disease of this organ and of the neck of the bladder. The patient has a frequent desire to make water, the passage of which is attended with a scalding sensation along the urethra, and more or less spasm and tenesmus; there is severe pain in the region of the affected part, of a sharp, burning, or lancinating character, and darting through the neighboring parts; constant itching and uneasiness are experienced in the head of the penis; and the urine, which is voided perhaps every half hour, is more or less turbid, and loaded with a thick, glairy, ropy mucus. Occasionally there is a discharge of blood, variable in quantity, as well as in regard to the frequency of its recurrence. The local symptoms, in fact, generally strongly simulate those of vesical calculus. The introduction of the catheter is always attended with excessive pain, and an aggravation of the local distress; pressure on the perineum, and the insertion of the finger into the rectum, produce similar effects. In the more violent forms of the affection, the patient finds it impossible to remain long in the erect posture, or even to sit on a chair; all active exercise, in fact, is impracticable. Perhaps the most reliable circumstances, in a diagnostic point of view, are, the absence of vesical calculi, long-continued suffering in the neck of the bladder, a constant secretion of thick, glairy mucus, a frequent desire to void the urine, and an occasional discharge of blood. In the progress of the disease, the constitution necessarily suffers; the digestive organs become deranged; the flesh wastes; the countenance is wan, thin, and haggard; the pulse is small and irritable; and the patient, worn out by the loss of sleep and physical suffering, gradually falls into a state of marasmus, from which he is destined never to recover.

The treatment of ulceration is altogether unsatisfactory and empirical. Attention must be paid to the general health, by regulating the diet, the bowels, and the secretions; the warm bath should be used from time to time; the patient should avoid exercise and the erect posture; pain should be allayed by opiates; the bladder should occasionally be washed out with tepid water, either simple or medicated; and the affected surfaces should be lightly touched once every few days with a solution of nitrate of silver, ten grains to the ounce, applied with a piece of soft

sponge, projected from an open catheter canula. If the pain, scalding, and spasm are great, leeches and counter-irritation will be beneficial. The best internal remedies are balsam of copaiba, cubeba, and spirits of turpentine largely diluted with demulcent fluids. When no impression can be made upon the suffering parts by these means, the only rational plan is to divide the gland freely through the perineum, taking care to keep the wound open until the ulcers are healed.

CHAPTER II.

PROSTATORRHŒA.

PROSTATORRHŒA, an affection which I have been the first to describe,¹ is, as the term implies, a discharge from the prostate gland, generally of a thin mucous character, dependent upon sub-acute or chronic inflammation of the glandular elements of that organ, and liable to be confounded with other lesions, as gleet, seminal losses, and cystorrhœa, from which, however, it is usually easily distinguished.

Prostatorrhœa is rare in childhood, because all kinds of diseases of the prostate are uncommon in impubic subjects. That it may occur, however, even at a very tender age, is altogether likely, especially in children laboring under stone in the bladder, prolapse of the bowel, or worms in the rectum, causing reflected irritation. After the twentieth year the disease is sufficiently common, and instances are occasionally met with even in very old persons. As long as the prostate gland remains small and inactive, or is not brought fully under the influence of the sexual organs, with which it is so intimately associated, it is comparatively infrequent.

All classes of persons are liable to suffer from this affection; but it is most frequent in those of a sanguineo-nervous temperament, with strong sexual propensities, leading to frequent indulgence of the venereal appetite, if not to positive venereal excesses, either in the natural manner or by masturbation. An irritation is thus established in the prostate gland, attended with more or less discharge of its peculiar secretion, normal or abnormal. Single and married men are, apparently, equally prone to it. Once established, it is probable that certain occupations may serve to keep it up; and it is also likely that there are certain employments which may predispose to it. Intemperance in eating and drinking, frequent horseback exercise,

¹ North Amer. Med.-Chir. Rev., July, 1860, p. 693.

sexual abuse, and disease of the bladder, anus, and rectum, may all be regarded as contributing to such a result.

The exciting causes of prostatorrhœa are not always very evident. In most cases the affection is traceable, either directly or indirectly, to venereal excesses, unsatisfied sexual appetite, chronic inflammation of the neck of the bladder, stricture of the urethra, especially when seated far back, or hyperæsthesia of this canal. Sometimes it has its origin in disorder of the lower bowel, as hemorrhoids, prolapse, fissure, fistule, ascarides, or the lodgment of some foreign body. It is easy to conceive how reflected irritation might induce this disease. The connection between the prostate gland and ano-rectal region is very close and intimate, and, hence, whatever affects the one will almost be sure, in time, to implicate the other, either in consequence of proximity of structure, or of nervous communication. Temporary prostatorrhœa is occasionally excited by the exhibition of internal remedies, as drastic cathartics, cantharides, and spirits of turpentine; or, in short, whatever has a tendency to invite a preternatural afflux of blood to the prostate gland and neck of the bladder, or to the posterior portion of the urethra. Another cause of the disease, and, according to my experience, a very common one, especially in young men, is masturbation or self-pollution. Many of the most obstinate and perplexing cases of it that have come under my notice were the direct result of this detestable practice.

The symptoms of prostatorrhœa are sufficiently characteristic. The most prominent, as already stated, is a discharge of mucus, generally perfectly clear and transparent, more or less ropy, and of varying quantity, from a few drops to a drachm and upwards, in the twenty-four hours. It is seldom that it is puriform, and still more rare that it is purulent; but it frequently contains mucopurulent casts of the ducts of the prostatic follicles, which appear like bits of thread floating in the urine. When considerable, the flow keeps up almost a constant moisture at the orifice of the urethra, and may even make a decided impression upon the patient's linen, leaving it wet and stained, somewhat in the same manner as in gleet or gonorrhœa, though in a much less marked degree. The most copious evacuations of this kind generally occur while the patient is at the water-closet, engaged in straining, especially if the bowels are constipated, or the fecal

matter is uncommonly hard, or greatly distends the rectum, so as to exert an unusual amount of pressure upon the prostate gland.

The discharge, whether small or large, is often attended with a peculiar tickling sensation, referred by the patient to the prostate gland, from which it frequently extends along the whole length of the urethra, and even to the head of the penis. In some cases, indeed in many, the feeling is of a lascivious, voluptuous, or pleasurable nature, not unlike that which accompanies the earlier stages of sexual intercourse. Not a few patients experience what they call a "dropping sensation," as if the fluid fell from the prostate gland into the urethra. Other anomalous symptoms often present themselves, such as a feeling of weight and fatigue in the region of the prostate, the anus and rectum, or along the perineum, with, perhaps, more or less uneasiness in voiding urine, and a frequent desire to empty the bladder; some patients are troubled with morbid erections, and their sleep is interrupted with lascivious dreams.

It is astonishing how much the patient's mind often suffers in this affection. The discharge, even if ever so insignificant, occasions him the greatest possible disquietude; for at one time he imagines that it is a source of much bodily debility, or that it is productive of weakness and soreness in the dorsolumbar region, especially if these symptoms happen to coexist; at another, that he is about to become impotent, under the delusive idea that the flow is one of a seminal character; an idea which not unfrequently haunts him day and night, and from which hardly anything can, perhaps, even temporarily divert his attention. His mind, in short, is poisoned, and the consequence is that he is incessantly engaged in trying to obtain relief, running from one practitioner to another, distrusting all, and affording none an opportunity of doing him any good. In the worst forms of the affection, his business habits are destroyed, he becomes morose and dyspeptic, and he literally spends his time in watching for the discharge which is the source and cause of his terrible suffering.

The affections with which prostaticorrhœa may be confounded are the various forms of urethritis, especially gleet, discharges of semen, and chronic inflammation of the bladder.

From urethritis, whether common or specific, it is generally

easily distinguished by the history of the case, the nature of the discharge, and the attendant local phenomena. In most cases, the affection comes on gradually, not suddenly, as in gonorrhœa or simple inflammation, and without impure connection; the discharge is white or grayish, translucent, and ropy, not purulent, opaque, and yellowish; and there is ordinarily no burning or scalding in micturition. In gleet, the signs of distinction are sometimes more difficult; but even here a satisfactory conclusion may generally be reached by a careful consideration of the history of the case, and a proper examination of the discharge, which is nearly always more or less puriform, as well as more abundant than in prostaticorrhœa. When the discharge of the urethra is kept up by the presence of a stricture, the diagnosis can be determined only by a thorough examination with the exploratory bougie.

Very many patients confound this discharge with a flow of semen; an idea in which they are often encouraged by their attendants, in consequence of their ignorance of the nature of the affection. Much has been said and written respecting diurnal spermatic emissions; but, according to my experience, these evacuations are among the rarest occurrences met with in practice. We are often told that they take place at the water-closet, during efforts at straining, and this is, no doubt, occasionally the case; but more commonly it will be found that these discharges are of a strictly prostatic character, the fluid being forced out of its appropriate receptacles into the urethra, along which it is presently discharged. This delusion will be more likely to take hold of the mind if the escape of the fluid be accompanied by a sort of pleasurable sensation, somewhat similar to that which follows a feeble emission. Persons affected with prostaticorrhœa will often tell us that they have quite a number of such evacuations—perhaps as many as six or eight—during the twenty-four hours, especially if they are troubled with disease of the ano-rectal region, leading to frequent visits to the water-closet, or if they are much in female society, engaged in exciting reading, or addicted to the pleasures of the table or to inordinate sexual intercourse, eventuating in general and local debility. Should the history of the case fail to afford the requisite light, it may be promptly supplied by a microscopic examination of the suspected fluid, semen always reveal-

ing distinct spermatozoa, whereas the prostatic and urethral secretions rarely afford any such indications. The prostatic mucus, moreover, differs from that poured out by the urethra in containing minute concentric amyloid bodies.

The characteristic symptom of cystorrhœa, or chronic inflammation of the bladder, is an inordinate secretion of purulent mucus, associated, in nearly all cases, with an altered condition of the urine, frequent and difficult micturition, pain in the region of the affected organ, as well as in the surrounding parts, and more or less constitutional disturbance. In prostaticorrhœa there may also be more or less uneasiness low down in the pelvis, with trouble in voiding urine, especially where the prostate is much enlarged, so as to cause constant vesical irritation; but the two disorders are so widely different as to render it impossible to confound them.

The pathology of this affection consists in chronic catarrhal inflammation of the mucous follicles of the prostate, leading to an inordinate secretion and discharge of its peculiar fluid. That this is the case, is shown by the character of the concomitant phenomena, and also by the fact that this organ is frequently, if indeed not generally, found to be more or less enlarged and indurated, and painful on instrumental contact. Nevertheless, there are cases, and these are by no means uncommon, in which it is, to all appearance, either entirely healthy, or so nearly so as to render it impracticable, by the most careful exploration, to discover any departure from the normal standard. The discharge under such circumstances seems to be the result solely of a heightened functional activity, probably connected with, if not directly dependent upon, disorder of the seminal vesicles, the urethra, neck of the bladder, or recto-anal structures; in other words, upon reflected irritation.

The prognosis of prostaticorrhœa is generally favorable; for it does not, in itself, present anything grave, being, as just stated, not a disease, but merely a symptom of a disease, usually slight, and therefore easily removable. Its obstinacy, however, is often very great, and hence the surgeon should always be guarded in the expression of his opinion respecting a rapid cure. When the mind deeply sympathizes with the local affection, as is so frequently the case, especially in young men of a nervous, irrita-

ble temperament, there is no disease which, according to my experience, is more difficult of management, or more likely to result in vexation and disappointment.

In the treatment of this affection, one of the first and most important objects is to inquire into the nature of the exciting cause, which is best fulfilled by a thorough exploration of the genito-urinary apparatus and of the anus and rectum. For this purpose, a catheter or exploratory bougie is employed, with a view of ascertaining the condition of the urethra, the prostate, and the bladder, aided by the finger in the bowel, previously emptied by an enema. In this manner, the surgeon becomes at once apprised of the existence or non-existence of stricture of the urethra, and of the presence or absence of morbid sensibility of its mucous membrane; the size and consistence of the prostate, and the state of the urinary reservoir, particularly as to whether there is inflammation, stone, hypertrophy, or other lesion. The finger in the rectum will be of great service, not only in detecting disease in the prostate and bladder, but also in this tube itself and in the anus. Indeed, without its aid no exploration of these organs could be at all satisfactory. If disease of the seminal vesicles exist, it will usually be evinced by tenderness on pressure through the wall of the bowel, provided the finger is sufficiently long or the prostate is not too voluminous.

The habits of the patient should be particularly inquired into. In many of this class of persons they are decidedly lascivious, or marked by excessive sexual indulgence, either naturally or in the form of masturbation, the prostate gland, seminal vesicles, and adjoining structures being thus kept in a state of continual excitement, highly favorable to the production of prostaticorrhœa. The nature of the patient's diet, his temperament, the state of his health, and his mode of life as it regards sleep and exercise, both of mind and body, also deserve special consideration.

Having ascertained the above facts, or, in other words, having made himself perfectly familiar with the local and general condition of the patient, the surgeon will be able, in most cases, to institute something like a rational mode of treatment. This should be directed, as a general rule, partly to the system at large, partly to the suffering structures.

In many of the cases the patient is weak, or deficient in mus-

cular and digestive power, indicating a necessity for tonics, as iron, quinine, and strychnia, a nutritious diet, with a glass of generous wine, and gentle exercise in the open air, either on foot or in an easy carriage; riding on horseback being scrupulously avoided, as likely to keep up undue excitement in the parts. One of the best preparations of iron is the tincture of the chloride, in union with tincture of nux vomica, in the proportion of twenty drops of the former to ten of the latter, four times a day. If the patient be plethoric, he may use with great advantage small doses of tartar emetic, in the form of the antimonial and saline mixture, care being taken not to nauseate. In either case, it is of paramount importance to correct the secretions and to maintain a soluble condition of the bowels. Drastic purgatives are of course avoided, as they would only tend to perpetuate the mischief. Unless the patient is actually debilitated, he should rigorously abstain from condiments and high-seasoned dishes. When the mucous membrane of the prostatic urethra is morbidly sensitive, bromide of potassium, in full doses, is indicated.

Among the more important topical remedies are, first, moderate sexual indulgence, as a means of allaying undue excitement of the prostate and its associated organs; secondly, cooling and anodyne injections, or weak solutions of nitrate of silver and laudanum, or, what I generally prefer, Goulard's extract with wine of opium, in the proportion of from one to two drachms of each to ten ounces of water, applied by means of the catheter syringe represented at page 78, three times a day, and retained three or four minutes in the passage. In obstinate cases, cauterization of the prostatic portion of the urethra, or even of the entire length of this canal, may be necessary, the operation being repeated once a week. When the prostatic portion of the urethra is not excessively sensitive, I know of nothing that exerts so beneficial an effect as the introduction, in gradually increasing sizes, of the conical steel bougie, at first every second day, and afterwards every day. The cold hip-bath should be used twice in the twenty-four hours; the lower bowel should be kept cool and empty; and, if the disease do not gradually yield, flying blisters, by means of cantharidal collodion, should be applied to the perineum, between the anus and scrotum.

Whatever may be the plan of treatment, perseverance and an

occasional change of prescription are indispensable to success. When there is deep mental involvement, amounting to sexual hypochondriasis, hardly anything will effect a cure; or, more correctly speaking, it is almost impossible to induce the patient to believe that he is well, or that nothing serious is the matter with him. Under such circumstances the chief dependence must be upon travelling, and an entire change of scene and occupation. If the patient be single, matrimony should be enjoined.

CHAPTER III.

HYPERTROPHY OF THE PROSTATE.

HYPERTROPHY of the prostate is an augmentation of the volume of that organ, produced by increased nutrition and excessive growth of its constituent elements. There are several forms of it, but the most common by far is that to which the term *senile* has been applied, from its being a frequent accompaniment of old age.

Hypertrophy may occur in any part of the organ. Most commonly it affects the entire gland, although not uniformly. In about 15 per cent. of all instances, enlargement of the middle lobe predominates; in about 9 per cent. the left lateral lobe, and in about 6 per cent. the right lateral lobe, is mainly affected. It rarely happens that one lobe alone is the seat of the trouble.

The affection exists in various degrees, from the slightest augmentation of the natural volume of the prostate to the dimensions of a pullet's egg, a walnut, an orange, or even a small cocoanut. The greatest increase of volume usually occurs in the long axis of the organ, in consequence, no doubt, of the want of resistance in this direction. Under these circumstances, the lateral lobes are of an elongated, oval shape, generally larger in the middle than at the extremities, convex in front, and rather compressed behind. When, on the contrary, the hypertrophy advances equally in all directions, these bodies will be apt to be somewhat obround, or like the half of an orange. Enlargement of the gland in front and below is opposed by the elevator muscles of the anus, the deep perineal fascia, and the pubic bones. Occasionally the organ increases more in the transverse than in the vertical diameter, extending outwards towards the sides of the pelvis, and thus overlapping and compressing the rectum. The adjoining engraving, fig. 114, from a specimen in the collection of Dr. Sabine, of New York, represents the prostate greatly enlarged in every direction, and of a flattened, cylindrical shape. The size is reduced one-half.

When the lateral masses are equally enlarged, they frequently project inwards towards the median line, so as almost to touch each other. This occurrence, however, is rare, and is met with only in the more aggravated forms of the malady. More

Fig. 114.



General Hypertrophy of the Prostate.

commonly there is a small interval between them, representing the appearance, when the gland is laid open longitudinally along its upper surface, of a median groove or gutter. When one lateral lobe is more enlarged than the other, the more bulky one frequently encroaches more or less upon the smaller one, and thus produces a lateral curvature, or a change in the direction of the neck of the bladder and the commencement of the urethra. Again, it occasionally happens that one lobe projects over on one side, and the other lobe on the opposite, giving rise thereby to two curvatures instead of one, as in the former case.

Whatever may be the shape of the enlarged masses, or the direction in which the hypertrophy occurs, their surfaces, both external and internal, may be perfectly smooth, or they may be more or less irregular, bosselated, and even lobulated. Sometimes small prominences exist upon them, attached by a broad base, and evidently prolonged from their substance, which they resemble in color and structure. Fig. 115, from a specimen in my collection, exhibits this form of the enlargement. Several such bodies are occasionally found close together, thus producing a lobulated appearance. Cysts sometimes form in the enlarged masses, from the size of a pea up to that of a large marble, filled

with serous fluid, and lined by a fibrous membrane. Finally, the surface of these bodies has been found excoriated, fissured, and even ulcerated.

Fig. 115.



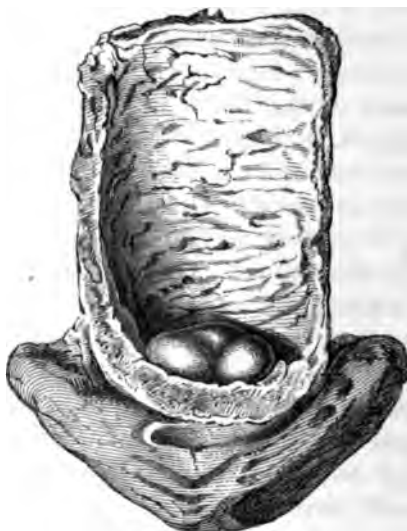
General Hypertrophy of the Prostate.

When the middle lobe is hypertrophied, it generally forms a sort of mammillated process, which is more or less vertical in its

Fig. 116.



Fig. 117.



Hypertrophy of the Middle Lobe.

position, and varies in size from that of the female nipple to that of a pullet's egg, as in figs. 116¹ and 117. The apex of the tumor is free and rounded, while the base is immovably fixed, and rests as it were upon the posterior extremity of each lateral mass. Its position is usually median; but it sometimes projects more to one side than the other, and thus creates an additional impediment to the introduction of the catheter. Although the form of the third lobe, when hypertrophied, is generally as here represented, cases occasionally occur in which it is exceedingly irregular, setting everything like accuracy of description at defiance. Next to the mammillated variety is, according to my own observation, the triangular, in which the tumor is large behind and narrow in front, terminating in a tolerably sharp crest. More rarely it is of a rounded shape, or broad and convex on its free surface, and adherent by a small pedicle. I have seen specimens in which the swelling consisted of three oblong bodies,

Fig. 118.



Hypertrophy of all the Lobes.

placed side by side, as in fig. 118, from a specimen in my private cabinet; and examples are recorded in which there were as many as four and even five such lobes. Whatever be the form and volume of the tumor, it always projects towards the bladder,

¹ From a specimen in the private collection of the late Professor Mott.

drawing up the prostatic portion of the urethra, and elongating the verumontanum.

The consistence of a hypertrophied prostate is liable to considerable diversity, and occurs under two very opposite forms, the hard and the soft. In the first, the more frequent of the two, the induration varies from the slightest increase of the natural consistence to the firmness of the fibrous tissue. When the induration exists in a high degree, the affected part tears with difficulty, and offers considerable resistance to the scalpel, but does not yield a crepitating sound. Interspersed through its substance are numerous enlarged follicles of a grayish color, rounded or oval in their shape, and hardly as large as a millet-seed. In the soft variety, the enlargement proceeds in a more uniform manner, and attains, as a general rule, a greater magnitude than in the hard. The affected tissues are more or less elastic, and yield readily under the pressure of the finger. The follicles, larger and more conspicuous than in the first variety, are of a soft, spongy texture, and of a whitish or grayish aspect.

In senile hypertrophy, which generally takes place under the influence of causes operating in a slow and gradual manner, there is usually a diminution of color, in consequence, apparently, of the concomitant compression of the capillary vessels which ramify through the substance of the organ. Hence, if a section be made of the parenchymatous structure, the surface will be seen to be of a dull grayish, light ash, or pale drab tint, and to emit hardly any blood on pressure. When the hypertrophy is produced and kept up by irritation, there is sometimes an increase of color, and an augmented capillary circulation. Under such circumstances, the parenchymatous substance may exhibit various shades of red and brown, and afford a considerable quantity of blood under pressure and maceration.

The weight of a hypertrophied prostate is necessarily augmented in all cases. In the adult, the average weight, in health, is from three to five drachms. In the affection under consideration the weight ranges from seven to fourteen drachms. In the more aggravated forms, it sometimes amounts to several ounces. Cadge¹ met with an instance in which the organ weighed twenty ounces, and measured five inches in length, four inches in width, and three inches and a half in depth.

¹ Trans. Path. Soc., Lond., vol. xviii. p. 192.

Hypertrophy is always produced by causes which act in a slow and permanent manner. Habitual engorgement may, therefore, be regarded as its immediate precursor, since augmented action necessarily occasions an augmented afflux of blood, and a corresponding increase of nutrition. Amongst the more frequently enumerated causes are prolonged and excessive venery, stricture of the urethra, calculous and other disease of the bladder, gonorrhœa, and horseback exercise. The use of stimulating diuretics, and alcoholic drinks, exposure to cold, the repulsion of cutaneous diseases, gout and rheumatism, external violence, the frequent introduction of the catheter, and habitual straining at stool, may all be mentioned as so many exciting or predisposing causes of the affection.

Hypertrophy, not the result of old age, may arise at any period of life, under the influence of inflammatory excitement and vascular engorgement. I have observed cases of it from this cause in subjects under five years of age, but it is most common in middle life from the extension of gonorrhœal inflammation and other sources of permanent irritation.

The senile form of the affection rarely occurs, at least not in any considerable degree, before the fiftieth year; slight evidences of it are occasionally met with at forty-five, and, indeed, even at forty, but this is exceedingly rare. It was, until lately, a very generally received opinion that the prostate necessarily enlarges in elderly subjects, or, in other words, that hypertrophy is a natural result of old age. That the influence of advancing years, however, in the production of the affection has been greatly overrated, will appear from the subjoined table of 312 examinations made at my request by my friend Dr. John W. Lodge, in 1859, while resident physician at the Philadelphia Hospital.

Number.	Age.	Normal.	Hypertrophied.	Atrophied.
23	40 to 50	21	2	..
94	50 to 60	78	18	8
113	60 to 70	84	27	2
64	70 to 80	58	11	..
15	80 to 90	12	8	..
3	90 to 100	8	..	..
Total ... 312		246	61	5

It thus appears that hypertrophy of the prostate occurred in only 20 per cent. of individuals after the fiftieth year, a result which is one-fifth higher than that obtained by Professor Dittel and Dr. Chrostina¹ from an examination of 115 inmates of the Vienna Almshouse, whose ages varied from fifty-two to one hundred years; the average being seventy. The organ was hypertrophied in 18, or 15 per cent., and atrophied in 36, or 31 per cent. Of 164 dissections of the prostate, after the age of sixty, by Sir Henry Thompson and Dr. J. C. Messer,² the gland was enlarged in 56, or 34 per cent., and atrophied in 11, or 6.7 per cent. Hence of 568 ante or post-mortem examinations of men after the fiftieth year, only 133, or 23.41 per cent., disclosed the existence of this condition.

It is interesting to observe that, while hypertrophy of the prostate is most common between fifty-five and sixty-five, it does not appear to affect the longevity of the patient; nor does it awaken any symptoms in more than one-half of the cases, or, if it does, it is not a subject of complaint. Elderly persons, however, are not very liable to call attention to their troubles, as is shown by some facts ascertained by Dr. Lodge. In the majority of cases, the rectum was the seat of hemorrhoids, fistule, or stricture, innocent or malignant, but the persons were not aware of their existence.

In its histological construction, an hypertrophied prostate may be regarded as a fibromuscular tumor, as it depends essentially upon hyperplasia of the muscular and fibrous elements, which constitute its parenchyma, at the expense of the glandular structures, which disappear in part or entirely. In the softer and more spongy form of the affection, all of the constituents of the prostate are involved, dilatation and epithelial hyperplasia of the acini progressing *pari passu* with the parenchymatous growth, which is infiltrated with a thick, brownish fluid, so that the different elements bear about the same relation to one another as in the normal organ. In no instance, however, has the development of new glandular elements been demonstrated.

Senile hypertrophy generally advances very tardily, and hence

¹ *Medizinische Jahrbücher*, xiv., 1867.

² *The Diseases of the Prostate*, Phila., 1873, p. 139.

a long time often elapses before the gland attains such a bulk as to lead to serious inconvenience. In many cases, indeed, after having acquired a certain magnitude, its progress is arrested, and the organ remains stationary for several years, if not during the rest of life. The inflammatory form, on the contrary, is usually more rapid in its march, and may attain a considerable height in a few months. It is also less persistent than senile hypertrophy, and is more amenable to treatment.

The affection is usually very insidious in its mode of invasion and the circumstances attending its progress. No symptoms indicative of its seat or peculiar character show themselves until long after the mischief has commenced. Its march is not only slow, but eminently stealthy and deceptive. The affection, in a word, is chronic from its inception, and cannot, without great difficulty and circumspection, be distinguished, in its earlier stages, from chronic disease of the bladder and the urethra.

Irritation at the neck of the bladder, and a frequent desire to pass the urine, are the symptoms which generally first attract the attention of the patient. From the mildness, however, of their character, they rarely create any unpleasant apprehensions, and the real nature of the disease, therefore, is often overlooked at a time when a knowledge of it is of paramount importance. By degrees other troubles are added, and it is in this manner that he is finally brought to a full sense of his situation. The distress at the neck of the bladder becomes more constant, as well as more severe, and there is not only a frequent desire to void the urine, but great difficulty in starting it. The stream also is unnaturally feeble, and smaller than in health. Slight pain is felt along the urethra, accompanied by a burning, smarting, or scalding sensation in the head of the penis, and a free discharge of prostatic fluid. In consequence of the frequent and violent straining which attends micturition, hemorrhoids, hernia, and prolapse of the bowel are apt to occur; and, for the same reason, the feces are liable to be voided simultaneously with the urine. The mucous membrane is sometimes habitually everted at the verge of the anus, and exhibits itself in the form of a red, tender fold, which is constantly irritated from exposure to the atmosphere, the contact of acrid secretions, and the pressure of the adjacent parts. The rectum never feels entirely empty, even after the most thorough purgation, but as if it con-

tained a lump or ball, and the feces are often passed in a flattened form, especially if they happen to be of a solid consistence. At night the patient is disturbed by an involuntary discharge of seminal fluid, or he is perhaps harassed with erections without emissions. This phenomenon occasionally exists in very old men, and adds greatly to the local distress. The testicles sometimes sympathize with the affected gland, becoming very tender, and even enlarged. Hernia may also be produced by the straining which attends micturition.

As the affection advances, the symptoms become more and more aggravated, although they are still essentially the same in character. The desire to urinate increases in frequency; the bladder is less patient of its contents, which are liable to escape involuntarily at night; the pain is more severe and constant, as well as more extensively diffused; micturition is attended with greater difficulty; and the prostate is the seat of a constant feeling of soreness. The general health, which until now was, perhaps, tolerably good, gradually declines; the appetite fails; emaciation ensues; the sufferer, obliged almost incessantly to make water, obtains hardly any sleep; and the constitution is at length exhausted.

The pain which accompanies this affection varies in different individuals, and in the same person under different circumstances. It is not in proportion to the size of the organ, but to the difficulty in expelling the urine. It is generally felt most keenly at the neck of the bladder, behind the pubes, in the urethra, and at the head of the penis. It is increased by exercise, the erect posture, the pressure of the urine, and by sexual intercourse. In most cases, it extends to the surrounding parts, as the perineum and the anus, the testes and spermatic cords, the sacrum, loins, thighs, and groins. It may be dull, heavy, or aching; throbbing or pulsatile; hot, scalding, or burning; or sharp and darting, as in neuralgia. Very often it is of a spasmodic nature, and is accompanied by the most violent tenesmus. The patient sometimes complains of a "bruised feeling," or of a sense of soreness, at first in the perineum, and afterwards about the anus, in the thighs, and groins.

A very unpleasant symptom of this affection is a sense of weight or fulness in the pelvis, and a feeling as if the bladder were never entirely empty. This evidently arises from two

circumstances: first, from the pressure of the enlarged gland itself, and, secondly, from the presence of a certain quantity of urine, which is never wholly expelled, no matter how violent may be the efforts made for that purpose. The fluid which is thus retained is soon decomposed, and thus becomes a source of irritation both to the bladder and the affected gland.

The urine, at first perfectly clear, and, to all appearance, natural, becomes gradually changed in its properties, and sometimes even in its quantity. It is generally thick, fetid, acrid, and highly alkaline; depositing, upon standing, a great abundance of thick, ropy, purulent mucus, often streaked with phosphatic matter, and always firmly adhering to the bottom of the receiver. The fluid is soon decomposed—indeed it is frequently so before it is voided—and then always exhales a strong ammoniacal odor. When hypertrophy is accompanied by ulceration of the prostate, it is sometimes tinged with blood. The quantity of urine may be natural, increased, or diminished. In general, I have found it to be somewhat increased.

The urine, which is at first discharged only six or eight times a day, is at length voided every hour, every half hour, or even every ten, fifteen, or twenty minutes. During the act of micturition, the patient is obliged to straddle his legs, to bend his body forwards, and to make the most violent muscular efforts in order to accomplish his purpose. He strains and presses, in fact, with all his might, as if he were determined to expel not only his urine, but his bladder along with it. During these exertions feces frequently escape involuntarily, and the bowel descends several inches below the anus; his face is flushed, and his eyes look as if they were ready to protrude from their sockets. At last, after months and years, perhaps, of the most horrible suffering, the urine is either retained, or has to be drawn off constantly with the catheter, or it dribbles away incessantly, the sphincter being no longer able to perform its office. In general, the incontinence of urine is conjoined with retention; for, as was before stated, the bladder is rarely, if ever, wholly emptied, on account of the increased size of the prostate and the cul-de-sac which the former organ presents behind the latter.

The constitutional symptoms of this disease, like the local, are dependent rather upon the amount of sympathy manifested by the surrounding parts than upon the degree of enlargement of

the prostate. In the earlier stages there is little or no fever, and perhaps, in truth, little or no disorder of any kind. As the disease progresses, however, the health manifestly suffers; the tongue is coated, the pulse is irritable, the sleep is disturbed by unpleasant dreams, the skin is inclined to be dry, the feet are cold in the day and hot at night, the appetite is deranged, the bowels are irregular, and the urine is acrid and high-colored, at times scanty, and at other times preternaturally abundant. These symptoms, as well as the local, are liable to temporary aggravation from exposure to cold, exercise on horseback, venereal indulgence, stimulating drinks, and highly-seasoned food.

The diagnosis of hypertrophy of the prostate is generally easy. When an individual who has attained the age of fifty-five or sixty is affected with the train of symptoms above enumerated, the presumption is strong that the case is one of chronic enlargement of this body, and nothing else. The affections with which it is most liable to be confounded are stricture of the urethra, urinary calculi, catarrh of the bladder, and stricture of the rectum. All that is necessary to determine the diagnosis is a digital examination of the bowel.

The extent to which the gland encroaches upon the rectum is variable; it may be very slight, or it may be so great as to produce partial occlusion of the tube, and consequently more or less difficulty in defecation. The tumor is usually easily felt by the finger, and rarely exceeds the volume of a pullet's egg; it may be as big, however, as a middle-sized orange, or even as a small fist. It is commonly larger on one side than on the other, and feels like a hard, solid substance, the surface of which is either smooth and uniform, or knobby and irregular. In the earlier stages of the disease, the gland may generally be pushed a little upwards and to either side; but when it is much enlarged, it is immovably fixed behind and below the arch of the pubes, and imparts to the finger the sensation of a hard, firm, and inelastic body. The lateral lobes are always more easily distinguished than the middle, which, when much augmented in volume, is frequently dragged up so high as to be entirely beyond the reach of even the longest finger.

Valuable information, in regard to the size and shape of the tumor, may generally be obtained by an exploration of the prostate with the sound represented in fig. 51. The instrument,

warmed and well oiled, is introduced in the usual manner until it reaches the neck of the bladder, where, if there be any considerable enlargement, it will be almost sure to be arrested, and to convey to the finger the sensation as if it were pressing against a solid and resisting body. To surmount this obstacle, which may be either directly in the middle line, or towards either side, according as it is produced by the middle lobe, or by one or both of the lateral masses, it is generally necessary to insert the left index-finger into the rectum, and to use it to guide the instrument on into the bladder.

The conduct, if I may use the expression, of the instrument, as it passes along the neck of the bladder, will be influenced by the character and extent of the hypertrophy, and is deserving of particular attention. If the middle lobe alone is affected, the obstruction will be found at the middle line, and the handle will have to be considerably depressed to enable the beak to glide over it into the bladder. In addition to this it may be necessary, as above stated, to insert the finger into the rectum, in order to push the curved portion of the instrument close against the pubic arch. To ascertain the size of the tumor, the vesical extremity of the sound is hooked over its posterior surface, and passed successively around its sides, the finger being still in the bowel, and placed against the beak. When both the lateral masses are enlarged equally at their inner margins, unaccompanied by hypertrophy of the rest of the organ, the passage will retain its normal course, and the instrument will advance in a straight line, just as it does in the healthy state of the parts. If, on the contrary, the growth be unequal, the canal will incline to one side, and the deformity will be indicated by a corresponding change in the direction of the instrument. Sometimes a double curve exists, one being formed, for instance, by the right lobe, and the other by the left; or, there may be two projections on one side with two corresponding depressions on the opposite.

Hypertrophy of the prostate, especially when it exists in any considerable degree, is rarely unaccompanied by more or less suffering of the adjacent parts. The organ which is most liable to be implicated is the bladder, the muscular coat of which becomes greatly thickened and fasciculated, in consequence of the mechanical obstruction afforded by the prostate to the evacuation of the urine. For the same reason, the mucous membrane is

always in a state of chronic inflammation, and sometimes mammillated, ulcerated, or even sacculated. Another, and not very uncommon, effect is the formation of urinary calculi. When this event occurs, two circumstances, worthy of notice, are liable to take place: one is, that the stone is productive of less suffering from its inability to fall against the orifice of the urethra, and thus impede the discharge of the urine; and the other, that it is more difficult, from its concealed situation behind the prostate, to extract it.

The urethra, during the progress of this disease, often undergoes important alterations, which are liable to be followed by serious difficulty as it respects the evacuation of the urine and the introduction of the catheter and other instruments. These changes, which are deserving of attentive consideration, are limited exclusively to the posterior part of the canal, or that portion of it which is surrounded and embraced by the prostate, and are referable mainly to the dimensions, direction, and form of the passage.

Elongation of the prostatic portion of the urethra exists nearly always in the more aggravated forms of hypertrophy of this gland. It varies in degree from a few lines to two inches, which, however, it rarely attains. With this addition from disease, this portion of the canal may acquire a length of two inches, two inches and a half, and, in extraordinary cases, even three inches. Mr. Guthrie¹ mentions an instance in which the elongation was nearly four inches, requiring a proportionately long catheter to draw off the urine. With such an example, which is of course an extreme one, I have never met. The increase of length may be produced by hypertrophy of the lateral masses alone, by the middle lobe alone, or, as more commonly happens, by the joint agency of all these parts. When enlargement of the middle lobe predominates, the urethra is dragged up behind the pubic arch, and is thus proportionately augmented in length, at the same time that it generally presents a falciform curve, the convexity of which looks towards the rectum, as represented in fig. 119, from Thompson.

When the lateral masses alone are affected, in an equal degree, the intervening canal may retain its natural size and shape,

¹ Op. cit., p. 235.

or it may change its form, and become either diminished or increased in its dimensions. In a specimen in my cabinet, in which there is no appearance whatever of a middle lobe, but in which both the lateral portions are considerably augmented in

Fig. 119.



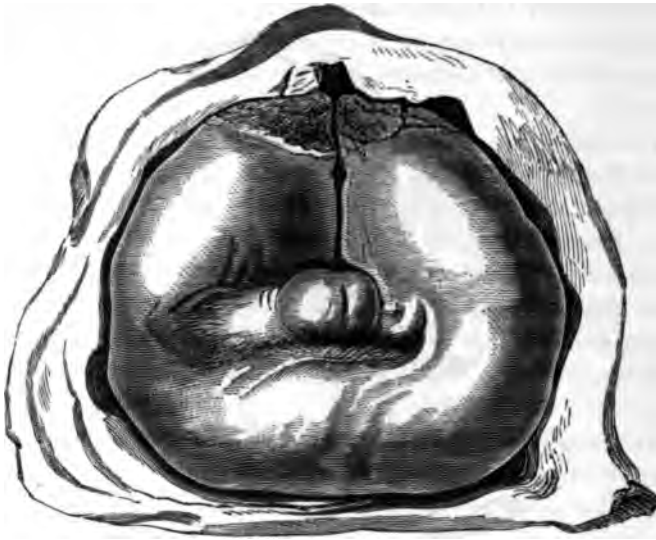
Angular Curvature of the Urethra from Hypertrophy of the Prostate.

volume, the prostatic part of the urethra is merely increased in length, while its form and size are apparently perfectly normal. From all absence of hypertrophy of the muscular coat of the bladder, it is evident that there was no obstruction during life to the evacuation of the urine. It is only, indeed, in cases where the increase of development takes place at the inner margins of the lateral lobes that the sides of the canal, embraced by them, will approach, and ultimately be brought into apposition with each other; a condition always accompanied by partial or complete retention.

In hypertrophy of all the constituent parts of the prostate, the included portion of the urethra generally presents itself in the form of a vertical slit, which in some of my examinations I have found to be fully three-quarters of an inch in depth, that is, in the recto-pubic direction, while its sides were occasionally almost, if indeed not quite, in contact with each other, as in fig. 120, from a specimen in my collection. In such a case as this the

obstruction must necessarily be attended with more or less impediment to the discharge of the urine, and hypertrophy of the muscular fibres of the bladder.

Fig. 120.



Vertical Elongation of the Urethra from Hypertrophy of the Prostate.

In a second series of cases of universal hypertrophy, the prostatic portion of the canal is materially increased in its diameter, evidently by the projection of the middle lobe between the two lateral, the edges of which are thus kept permanently asunder. This state, which occasionally exists to a great and deplorable extent, is often accompanied with incontinence of urine, which, under such circumstances, is liable to be ascribed to paralysis of the bladder.

Lateral curvature of the canal is generally dependent upon an unequal enlargement of the inner edges of the lateral lobes. An unusual projection on one side will necessarily encroach in a corresponding degree upon the other side, followed by a proportionate deviation from the median line. The curvature, which seldom exists in a high degree, is sometimes double; occasionally it is accompanied by a sort of contorted or twisted state of the urethra.

The form and dimensions of the vesico-urethral orifice, or

mouth of the urethra, are considerably influenced by the nature of the hypertrophy. When both lobes are equally and alone enlarged, it is generally circular, and but little, if any, diminished in size. Frequently it presents itself as a narrow, vertical slit, not unlike the chink of the glottis. This condition generally accompanies hypertrophy of the inner edges of the lateral lobes, and antero-posterior enlargement of the prostatic part of the urethra. In a third series of cases, it has very much the shape and appearance of the mouth of a pitcher closed by its lid; that is, it is a transverse fissure, bounded in front and at the sides by the lateral lobes, and behind by the enlarged central mass.

Lateral deviation of the urethra is sometimes produced by an irregular development of the middle lobe, the remainder of the gland being unaffected. In this manner one of the lateral masses is pushed to one side, followed by a corresponding bend in the canal, which is always most conspicuous at its posterior extremity. Finally, when the middle lobe is of unusual volume, the canal, as it extends backwards, becomes sometimes bifid, or separated into two grooves, bounded each by the contiguous surfaces of the middle and lateral masses.

The ureters are seldom entirely sound. The most common lesions are shortening and dilatation, or alternate dilatation and contraction, with irregular thickening or attenuation of their walls. The kidneys are liable to chronic inflammation, attended with changes of structure, size, and shape, and in some cases they undergo cystic degeneration. The seminal vesicles and testicles are occasionally involved, and it rarely happens that the rectum is free from disease.

Notwithstanding the numerous attempts that have been made from time to time to place the treatment of this affection upon a scientific basis, it must be confessed that it is eminently empirical, tentative, and unsatisfactory. These remarks are particularly true of the senile form of the complaint, which hardly ever yields to any mode of treatment, however judiciously devised or perseveringly employed. The disorder, in this respect, bears a close resemblance to certain kinds of morbid growths, which, when once developed, are utterly beyond the reach of medicine; no remedies exert the slightest influence upon their progress; nothing can change their character, modify their action, or suspend their nutrition. The malady progresses in

spite of the best-directed efforts of the surgeon, and only ceases with life.

If the patient be plethoric, the enlargement considerable, and the sympathetic reaction great, no remedy will be so likely to afford prompt and decided relief as the abstraction of blood from the perineum by leeches. This is true, whatever may be the character of the hypertrophy. The detraction of blood should always, in the more aggravated varieties of the complaint, be speedily followed by the use of the antimonial and saline mixture, in the hope of subduing the action of the heart, unlocking the secretions, and clearing out the bowels. All irritating or griping cathartics must here, as in most of the other affections of the prostate, be entirely proscribed. Aloetic and other preparations having a particular tendency to the rectum, are to be avoided. At the same time, it must be borne in mind that an overloaded state of the bowels is never permissible; on the contrary, it is to be carefully guarded against, for it can never exist for any length of time without producing an increase of irritation, if not positive mischief. Sulphate of magnesia, or jalap and bitartrate of potassa, by rendering the feces soft and watery, are particularly well adapted to cases of such a nature. Where manifest disorder of the biliary secretion exists, a few grains of calomel will generally prove serviceable. Sometimes a laxative enema answers a good purpose, and obviates the necessity of giving this kind of medicine by the mouth.

The food should be perfectly plain, easily digestible, and uniritating. It should be well masticated, and be free from all stimulating admixtures. Condiments of every description, wine, brandy, and fermented drinks, are carefully avoided. Unless strict attention be paid to these rules, no reasonable hope, even of temporary amendment, can be indulged.

All the exciting causes of the disease are to be carefully avoided. Above all, it is necessary that the patient should abstain from horseback exercise and from sexual intercourse. From the tendency which these pursuits have to produce engorgement of the prostate and the rectum, I am satisfied that too much stress cannot be laid upon their prohibition. I would even go so far, in all cases, as to make the injunction absolute. Where the passions are unusually strong, and the desire for sexual intercourse is very frequent, and almost unconquerable,

as it very often is in persons laboring under this complaint, it may be necessary for a time to interdict female society, until, by proper treatment, the feeling in question is subdued. The inflammatory form of the complaint, dependent upon stricture, calculus, or chronic prostatitis, generally disappears rapidly upon the removal of these complaints.

Repose in the horizontal posture is hardly less necessary here than it is in the more acute affections of the prostate. By this remark, I do not, of course, mean that the patient shall confine himself constantly to his bed, and avoid all exercise—by no means; on the contrary, he should not neglect, whenever the weather is pleasant, to stir about for a few hours every day in the open air, either on foot, or in an easy carriage. When in the house, he may lie upon a lounge, or recline upon an easy chair with a movable back. In either case, flannel must be worn next the skin, and exposure to cold be avoided.

For the purpose of acting directly, as it were, upon the gland, and thereby lessening its volume, various remedies have been proposed. Among the more important of these are, iodine and its different combinations, cicuta, mercury, hydrochlorate of ammonia, local depletion, and counter-irritation by issues, setons, blisters, and tartar-emetic pustulation. Of these remedies, it may be observed, in general terms, that their efficacy has been fully tested by different observers, and that they are all to be regarded in the light merely of palliatives. I have myself never witnessed any relief from their employment.

Ergot is a favorite remedy with my friend Dr. Washington L. Atlee, of this city, in the treatment of this affection. In a recent communication to me, this distinguished surgeon states that he is in the habit of administering twenty drops of the fluid extract of ergot every four hours, its action being supplemented by the use of the catheter twice daily, until the patient regains entire control over the bladder. As the power to urinate is restored, the frequency of the dose is diminished, and ultimately reduced to a single administration at bedtime. Several patients, whose ages ranged between sixty and ninety years, were enabled, under this treatment, to lay aside the catheter, after having been the victims of its daily use. A gentleman, of eighty-nine, whose treatment was commenced in August, 1872, by the methodical evacuation of the bladder, and whose death seemed to be imminent, has for the last three years maintained

his general health and his urinary organs in excellent condition, by the evening dose of the remedy. Apart from the evidence afforded by the experience of so trustworthy an observer, ergot should, on theoretical grounds, be well calculated to afford relief to a hypertrophied prostate, in the same way that it acts on uterine myomata. The nutrition of the organ being affected by the contraction of its bloodvessels and its muscular fibres, there should be a corresponding diminution of its volume.

The only local treatment deserving of mention is that by injecting the gland, through the anterior wall of the rectum, with solutions of iodine, to which attention has recently been directed by Professor Heine, of Innsbruck.¹ The patient being placed on his side, with the limbs retracted, a long, delicate exploratory trocar, guided by the index finger, is successively inserted to the depth of two lines into each lateral lobe a little to one side of the median furrow, in order to avoid a small artery which is frequently found in that situation, when a Pravaz's syringe is passed into the canula, and from twelve to twenty drops of a solution, composed of two drachms of iodide of potassium, two ounces of tincture of iodine, and six ounces of water, slowly thrown in. The operation is to be repeated at intervals of seven to fourteen days. Of six cases treated in this way, in only one was there inflammatory reaction and the formation of an abscess, which opened spontaneously on the eighth day, and was followed by almost complete atrophy of the gland. In a second case, in which from exposure, there was a return of the vesical symptoms, three additional injections were practised. On death from pneumonia, with purulent cystitis and pyelitis, a small abscess was found between the rectum and the prostate, which was probably due to the fluid having escaped into the connective tissue. In the remaining cases, the immediate effects of the remedy were great palliation of the symptoms of obstruction, and diminished frequency of micturition, with palpable involution of the gland. One died, in a fortnight, from exhaustion produced by previous disease, and there were no evidences of suppuration. In the other three, the symptoms were greatly relieved.

This plan of treatment deserves more extended trial; but the risks of suppuration, which is so frequent a result of injections into the parenchyma of other organs, must be borne in mind.

¹ Langenbeck's Archiv, Bd. xv. p. 88, and Bd. xvi. p. 79.

Finally, the patient must pay particular attention to the time and manner in which he voids his urine. Indeed, at the approach of the first symptoms, he should be taught the introduction of the soft, vulcanized catheters, represented on page 114, through the systematic use of which, complications, as cystitis, calculous disease, atony of the bladder, and dilatation of that organ, the ureters, and kidneys, may be prevented. If the amount of residual urine be small, the instrument need not be employed oftener than twice a day; but if it be large, the urine should be drawn off every six hours, any considerable accumulation being likely to prove a source of irritation, if not of actual disease of the affected parts. For the same reason, injection of the bladder, as advised under the head of cystorrhœa, often produces great relief by dislodging the thick, ropy, and offensive secretion, which so often collects in the bas-fond of the bladder.

When the obstruction to micturition is complete, and the capacity of the bladder is greatly diminished, so that a resort to the catheter becomes necessary nearly every hour, rendering the condition of the patient one of extreme misery, with rapid failure of the strength, the permanent retention of a tube in the bladder above the pubes, may be advisable to avert impending death. An opportunity is thus afforded to the water to drain off almost as fast as it is secreted, and the bladder, placed in an easy, quiet state, is prevented from constantly contracting on its contents. When the obstacle to the passage of the urine depends upon enlargement of the middle lobe, and the patient is in fair general health, I can see no objection to excising it. The operation could hardly fail, when that body is attached by a pedicle, and might afford the only chance of relief. I should certainly myself prefer it, in such an event, to the operation of crushing, recommended by some of the French surgeons, and to the formation of an artificial urinary fistule above the pubes. In executing the operation, the incisions would have to be the same as in the lateral operation of lithotomy, and the enlarged lobe could be easily cut away at its base with a probe-pointed bistoury, or a pair of stout, probe-pointed scissors, curved on the flat. That it would not be attended with any very grave risks, is attested by several examples, referred to in the chapter on Tumors of the Prostate, in which the median lobe was removed during the operation for vesical calculus.

CHAPTER IV.

ATROPHY OF THE PROSTATE.

THE prostate, like other organs, is liable to atrophy. As an effect of senile decay, it exists in about nine per cent. of all persons above fifty years of age, when it is usually complicated with disorder of the bladder, or of the bladder and urethra. It may result from exhausting diseases, as pulmonary phthisis and protracted diarrhœa, and it is also met with in eunuchs. The affection is, however, generally the result of mechanical compression, or structural disorganization. Thus, a calculous concretion, either developed in the gland itself, or lying habitually at the neck of the bladder, or the presence of a tumor in its immediate vicinity, may, by the pressure which they exert upon the prostate, lead to gradual absorption of its glandular and other elements, attended with great diminution of its volume. A similar change is sometimes brought about by an abscess, or a tubercular deposit, and it is not infrequently met with in cases of tight stricture of the urethra, in which hydrostatic pressure is exerted upon the organ by the urine contained in the sac formed by the dilated canal.

The extent of the atrophy varies. It may involve the entire gland, one of its lobes, or only a part of a lobe. In extreme cases the proper structure is almost entirely effaced, and hardly anything remains but its fibrous capsule, the weight being reduced two-thirds or three-fourths. In the more ordinary forms, however, the gland is only somewhat diminished in bulk, preternaturally firm, and of a paler color than in the normal state.

Of the symptoms and treatment of the affection nothing is known. In emaciated persons, when there is coincident atrophy of the sphincter muscle of the neck of the bladder, complete incontinence of urine may declare itself. Whenever the exciting cause can be determined, its removal may have a good effect upon the condition of the gland.

CHAPTER V.

TUMORS AND TUBERCLE OF THE PROSTATE.

SECT. I.—TUMORS OF THE PROSTATE.

THE occurrence of cysts and new growths of the prostate is rare. Of the latter, the most common and important, from a practical point of view, are fibromatous myoma, medullary or encephaloid carcinoma, and encephaloid sarcoma.

a. Cystic Tumors.—The prostate is occasionally the seat of retention cysts, dependent upon obstruction of its ducts, with dilatation of these canals and their terminal acini, and retention of their contents, which are of a clear, or opaline, viscid, mucous nature. Thus formed, the cysts vary in size from a millet seed to that of a pea, or even a hazel nut. In general, there are not more than six or eight; and examples occur in which there is only one, which is then proportionately large, occupying, perhaps, one-third of the entire gland. The organ itself is usually hypertrophied, and dense in its structure; but its parenchyma is, in great measure, absorbed, when the cysts are large or numerous. Nothing is known of their progress, termination, and treatment.

A second form of retention cyst, to which attention has been especially directed by Dr. Joseph Englisch,¹ of Vienna, is that due to congenital occlusion of the orifice of the sinus pocularis in the prostatic urethra, and the accumulation of the secretion of the numerous small glands which open on its inner surface. A knowledge of this variety of tumor is not devoid of practical interest, since a part, at least, of the cases of retention of urine in the new-born child may be traced to this cause. Dr. Englisch met with this anomaly in seven per cent. of numerous dissections of infants, the sac of the utricle either being distended and encroaching upon the urethra, or projecting, as a fluctuating swelling, behind the posterior margin of the prostate, in the

¹ Stricker's *Medizinische Jahrbücher*, 1873, Heft i., and 1874, Heft ii.

recto-prostatic space, or even extending as high up as the recto-vesical reflection of the peritoneum.

Compared with the size of the prostate at birth, these formations attain large dimensions, and give rise not only to difficulty or impossibility of micturition, but also awaken secondary changes in the associated organs. In all the cases cited by the Viennese physician, the bladder was distended, and its muscular walls hypertrophied; the ureters and pelves of the kidneys were dilated, and the walls of the former were thickened, while the latter were inflamed or atrophied. These effects depend less upon the volume of the cyst than upon its location; and are far worse when the obstruction, however slight, is seated at the anterior portion of the sinus, than when the cyst projects backwards towards the rectum.

In the absence of congenital atresia of the urinary meatus, or imperforate prepuce, the existence of utricular retention cysts in the new-born child, may be suspected from retention of urine, and the presence of the distended bladder above the pubes. The occlusion is sometimes so slight that the infant is able to overcome it by involuntary straining; but should this not be the case, the introduction of a silver catheter will suffice to evacuate the cyst and relieve the bladder. In the event of a small fluctuating tumor being detected by the finger in the rectum, it should be punctured with a delicate trocar.

β. Fibromatous Myoma.—Fibromuscular neoplasms, the so-called prostatic glandular tumors, are seldom met with in the normal prostate; but they are generally present in the hypertrophied organ of old persons, either as discontinuous or continuous growths. In the first, and by far the most frequent, form, section of the prostate discloses one or more rounded or ovoidal nodules, rarely exceeding six lines in diameter, imbedded in its parenchyma, and surrounded by a distinct capsule of fibrous tissue, from which it can be readily enucleated. They are usually solitary, and situated towards the outer surface of the posterior margin of the lateral lobes, although they may project inwards and encroach upon the urethra, imparting to its lumen the variations in size and shape, which have been already noticed in a preceding chapter. When they are seated at the periphery of the organ, they frequently give it a bosselated or lobulated outline, which may be detected by rectal palpation. Section of the

larger nodules displays a grayish or drab-colored homogeneous tissue, of a tough, inelastic character, having little moisture, and only a few vessels. The smaller growths, on the other hand, are of a soft, elastic consistence, and of a reddish-gray complexion.

In the second variety, the tumor occurs as a continuous, but outlying, mass, which is generally connected with the middle lobe of the prostate by a more or less delicate pedicle. Resembling a polyp in its configuration, it may attain the size of a chestnut or an egg, and it now and then contains concretions, and even small isolated nodules. Projecting into the cavity of the bladder, it may move on its attachment like a hinge or valve, and in this way act obstructingly to the discharge of the urine.¹

In their histological construction, these growths are homologous with the proper prostatic tissues, and they have their analogues in the tumors met with in the uterus, the only point of difference being that they do not undergo calcareous, cystic, or telangiectoid degeneration. The softer outlying variety usually contains glandular elements, which are absent in the intraprostatic nodules.

The existence of fibromatous myomas may be suspected during life; but they occasion no symptoms by which their presence can be positively determined. The isolated growths are not infrequently exposed by the surgeon during the lateral section of the prostate in lithotomy; and, although their accidental enucleation does not appear to entail any serious consequences, the advice of some surgeons to remove them, with a view of having less surface for suppuration and granulation, and diminishing the volume of the organ, should not be followed. Instead of expediting healing, their extirpation retards this process, and leads to the formation of a pouch, which acts as a supplementary bladder, thereby increasing the difficulty in voiding the urine,² and interfering with the introduction of the catheter. Should a polypoid outgrowth from the median portion of the prostate be met with in lithotomy, it should be cut away with the scissors or a probe-pointed bistoury, with the double object of removing

¹ Paget, *Lect. on Surg. Path.*, 3d ed., p. 380; and Rattray, *Trans. Path. Soc. Lond.*, vol. xviii. p. 188.

² See case by the editor, *Trans. Path. Soc. Philada.*, vol. iv. p. 153.

the obstacle to voluntary micturition, and preventing the formation of a new concretion. Sir Henry Thompson¹ states that he has twice removed such a tumor successfully, and an equally gratifying result was obtained by Sir James Paget,² who refers to two additional cases in other hands. If the existence of a valvular outgrowth of the middle lobe could be diagnosed, it should be reached by incisions similar to those practised in the lateral operation for stone.

γ. Carcinomatous Tumors.—Of the primary cancerous tumors, the only one met with in the prostate is the true epithelial glandular carcinoma, due to proliferation of the epithelial elements of its ducts and acini, and synonymous with the adenoid carcinoma of Billroth, as found in other glandular organs. It is a very soft, succulent, vascular growth, and is, therefore, to be classed among the medullary or encephaloid formations. Scirrhous, colloid, and melanosis are unknown.

By far the best accounts of this affection that have as yet appeared, are those of Professor Socin,³ Dr. Oscar Wyss,⁴ Dr. Jacques Jolly,⁵ and Sir Henry Thompson.⁶ All of these writers, however, have included in their descriptions cases, which, from the tender age of the subjects, the rapid progress of the disease, the large dimensions of the tumor, the absence of lymphatic involvement and secondary deposits, and confirmatory microscopical evidence, in at least two instances, which in their macroscopical characters resembled the remainder, should be classed among the sarcomas. These are considered sufficient reasons for their exclusion, and for drawing the following clinical history of carcinoma from adult cases, with lymphatic involvement and metastatic deposits in other organs. The cases, seventeen in number, in six of which, minute examination disclosed the histological peculiarities of carcinoma, are recorded

¹ Practical Lithotomy and Lithotrity, p. 126.

² Med. Times and Gaz., vol. ii., 1859, p. 529.

³ Hdbch. d. Allg. u. Spec. Chir., 1875, Bd. iii. Abth. ii. Lief 8, 2 Hälfte, p. 105.

⁴ Virchow's Archiv, Bd. xxxv., 1866, p. 378.

⁵ Archives Générales de Médecine, Ser. vi. t. xiii. pp. 577 and 705, and t. xiv. pp. 61 and 184.

⁶ Op. cit. p. 258.

by Langhaus,¹ Tyson,² Lebert,³ Guyon,⁴ Billroth,⁵ Thompson,⁶ Langstaff,⁷ Adams,⁸ Walton,⁹ Simon,¹⁰ Cock,¹¹ Dalby,¹² Fergusson,¹³ Armitage,¹⁴ and Wyss.¹⁵

Carcinoma of the prostate seldom occurs before middle age. The youngest subject in whom it has been met with was twenty-five years old at the time of the appearance of the first symptoms, the case being recorded by Billroth. One of Mr. Simon's patients was forty-one; while the oldest subject, who was under the care of Sir William Fergusson, was seventy-one years of age when the disease manifested itself. The average age, however, is fifty-seven years and a quarter, agreeing in this respect with the affection as it is met with in the bladder.

The exciting causes of the complaint are not understood. Traumatism does not appear to exert any influence upon its production. It generally arises spontaneously, being in many cases, doubtless, engrafted upon the previously enlarged organ, and makes considerable progress before it awakens any serious symptoms.

The neoplasm usually involves the entire gland, substituting its parenchyma, and often destroying all traces of its proper structure. In about one-third of all cases, it is confined to a limited portion of the organ, as the right or left lateral lobe, the base, or the median portion. In the instance recorded by Tyson, the middle lobe was converted into a tumor three inches in diameter. In whatever portion of the prostate it may be seated, it generally gives rise to a circumscribed, well defined, more or less ovoidal, even, rarely bosselated or lobulated, mass, which may reach the dimensions of a fist. Firm and tense in its earlier stages, it becomes soft and elastic with age. On section, it

¹ Hdbch. d. Allg. u. Spec. Chir., ut supra, p. 108.

² Proceedings Path. Soc. Philada., vol. iii. p. 116.

³ Virchow's Archiv, Bd. xxxv. pp. 381 and 389.

⁴ Arch. Gén. de Méd., t. xiv. p. 194.

⁵ Chirurgische Klinik. Zurich, 1860-1867, p. 343.

⁶ Op. cit., p. 269.

⁷ Med.-Chir. Trans., vol. viii. p. 279.

⁸ London Lancet, vol. i., 1853, p. 394.

⁹ Trans. Path. Soc. London, vol. ii. p. 287.

¹⁰ London Lancet, vol. i., 1850, p. 291.

¹¹ Adams on the Prostate, 2d ed. p. 147. ¹² Ibid.

¹³ London Lancet, vol. i., 1853, p. 473. ¹⁴ Thompson, op. cit., p. 270.

¹⁵ Virchow's Archiv, Bd. xxxv. p. 381, and case 26 of table.

almost always appears uniformly soft and white, like the brain substance; or it may be of a yellowish, spongy nature, and interspersed with cysts. In either case a milky juice exudes on pressure. Now and then, cavities, occupied by soft, friable tissue, purulent matter, or clotted blood, are formed, in consequence of partial gangrene, with fatty degeneration of the transformed gland cells, and rupture of the delicate vessels of the stroma. Histologically it is made up of a very delicate basis of connective tissue and capillaries, inclosing loculi, which are packed with small, polygonal, largely nucleated epithelial elements. In some cases, the stroma contains an abundance of smooth muscular fibres, and the alveoli are filled with large cylindrical cells.¹

Instead of being confined to the prostate, carcinomatous growths, in about one-half of all instances, show a tendency to perforate its investing capsule, and invade the associated organs. The most common seat of the secondary tumors is the trigone of the bladder, either in the form of numerous discrete nodules seated beneath the mucous membrane, which rarely ulcerate, or as a cauliflower excrescence, which partially fills the cavity of the viscus, and exhibits a great tendency to break down and bleed. Similar projections may be met with in the urethra, as in the case of Socin, in which the pedunculated mass was as large as a small walnut. Now and then, nodules are found beneath the corresponding urethral mucous membrane, which, by their confluence and softening, may convert that canal into a ragged excavation. The seminal vesicles, the rectum, and ureters may also be invaded by the rapidly proliferating growth.

Secondary deposits are found in at least ninety per cent. of all cases. The structures most liable to suffer in this way are, in the order here mentioned, the pelvic, lumbar, inguinal, and mesenteric lymphatic glands, the liver, lungs, pleura, kidneys, and spinal canal. The implication of the glands of the groin is not only of anatomical interest, but of great importance in a diagnostic point of view. In several cases thrombosis of the iliac vein has been observed.

In addition to these lesions, which depend exclusively upon the new formation, other changes are met with in the urinary

¹ Consult the reports of Billroth, Langhaus, Guyon, Lebert, Wyss, and Tyson.

organs, which may be referred to the mechanical impediment to free micturition. Of these the most common are hypertrophy and dilatation of the bladder, and inflammation, suppuration, or atrophy of the kidneys, and hydronephrosis.

The early symptoms of carcinoma of the prostate are, as would naturally be inferred, those of obstruction. Not only are there, as in ordinary hypertrophy of that body, frequent and difficult micturition, retention and incontinence of urine, but pain is superadded, which is rarely present in the latter affection. The suffering is present both during and after micturition, and is generally referred to the prostate and neck of the bladder; but it is also felt along the urethra, especially at the gland of the penis, and in the region of the sacrum, the loins, and hypogastrium, and it even radiates down the thighs. It is often constant and excruciating in its nature, and is increased by the straining efforts made to empty the bladder and the rectum. It is worthy of remark that it bears no direct relation to an open condition of the tumor.

Spontaneous hemorrhage is not so prominent a sign as in carcinoma of the bladder, as it only occurs in about one-half of all cases, in only one-fourth of which, however, is it an early manifestation of the disease. It is equally frequent whether the growth is ulcerated or not, although in the former condition, the loss is more profuse and exhausting than in the latter, in which the source of the bleeding appears to be rupture of the enlarged vessels of the prostatic urethra and neck of the bladder, during the straining efforts to void the urine. In exceptional instances, the hemorrhage is due to catheterism, the operation itself being frequently painful or difficult, if not, indeed, impracticable.

Additional evidence of the existence of the disease is afforded by the finger in the rectum, through which the enlarged, but exceptionally tender, organ, as well as the hypertrophied pelvic glands, may be detected. In the case recorded by Guyon, the patient being much emaciated, and the bladder empty, the tumor could be distinguished by hypogastric palpation; and in one, observed by Billroth, it formed a prominent swelling in the perineum. In thin subjects, the secondarily involved iliac and lumbar glands may be felt through the abdominal walls. The presence of indurated, and possibly tender, glands in one or both groins, as has been observed by Cock, Armitage, Lebert, and

Guyon, especially if they progressively augment in size, is a sign, the importance of which can scarcely be overlooked. This symptom, along with the greater suffering, and the less frequent occurrence of hemorrhage, serves to distinguish carcinoma of the prostate, on the one hand, from carcinoma of the trigone of the bladder, with which it may be confounded; and, on the other hand, when taken in connection with the excessive pain and marked cachexia, from senile hypertrophy of the prostate.

During the later stages of the affection, the so-called carcinomatous cachexia manifests itself by the sallow, shrunken features, the anxious and suffering expression of the countenance, by the rapid emaciation, loss of strength, frequent pulse, and night sweats. Edema of the scrotum and limbs, from thrombosis of the iliac or femoral veins, may also add to the patient's discomfort.

The duration of the disease varies from nine months to ten years, the average being three years and a quarter. In general terms, it may be stated that the older the patient, the longer is life preserved. The most frequent cause of death is exhaustion, favored in a few instances by hemorrhage. In some cases, coma, probably from uremic poisoning, terminates the scene. In one instance, rapid collapse was due to perforation of the bladder and peritonitis; while, in two, there was extravasation of urine, respectively from sloughing of the urethra and sloughing of the ureter.

The treatment of carcinoma of the prostate is entirely palliative. All that can be done is to relieve pain, support the strength, and empty the bladder with the soft catheter as often as may be required. When the general condition of the patient is good, the growth of the tumor is slow, and there is no reason to suspect lymphatic involvement or secondary deposits in the viscera, it becomes a question, which rests entirely with the judgment of the surgeon, whether life may be prolonged by extirpation of the tumor. Billroth¹ removed a mass, as large as a duck's egg, along with a portion of the bladder, from a man of thirty. The wound cicatrized, but the disease returned in eight weeks, and death ensued fourteen months after the operation. Nussbaum,² in 1866, successfully removed the rectum, the prostate, and base

¹ Chirurgische Klinik. Zurich, 1860-67, p. 342.

² Baier. Aeztl. Intelligenzblatt, No. 44, 1869.

of the bladder, all of which were invaded by carcinoma. Upwards of two years afterwards the disease returned, and the patient soon died, after repeated attacks of hemorrhage. Demarquay¹ has also extirpated the lower portion of the bowel, the membranous urethra, the prostate, the base of the bladder, and the seminal vesicles; but his patient died of purulent infection. In a second case,² he removed the anterior wall of the rectum and the prostate below the urethra, and the man remained well after the lapse of two years.

3. Sarcomatous Tumors.—Of the malignant diseases of the prostate, the only one met with, besides carcinoma, is sarcoma, the clinical history and physical appearances of which present some points of resemblance with those of the former affection. Although there are at least seven cases on record which might properly be included in this class of morbid growths, as the ages of the patients varied from twenty-three to forty-two years, and the minute examination, when made, showed, in general terms, merely masses of cells containing large nuclei, they will have to be excluded, as they are, to say the least, of doubtful nature. Indeed, the only authentic case of sarcoma in an adult, confirmed by minute investigation, is that reported by Socin,³ as occurring in a man, fifty-one years of age, who had been troubled with irritability of the bladder for one year, and with retention of urine, which demanded the constant use of the catheter, for six weeks before death from septicemia. Section disclosed, as represented in fig. 121, an ovoidal growth, which was attached to the median lobe of the gland by a delicate pedicle, which had been perforated by the catheter. The base of the tumor was calcified; while the remainder was soft, very vascular, and slightly ulcerated. The microscope disclosed a highly vascular round-celled sarcoma. A few mesenteric glands had undergone the same degeneration. The bladder was hypertrophied, and it, as well as the ureters and pelves of the kidneys, was dilated. The remainder of the prostate was not involved, but its glandular structure was enlarged.

With the foregoing exception, sarcoma of the prostate appears to be confined to infancy, childhood, and early boyhood. Thus

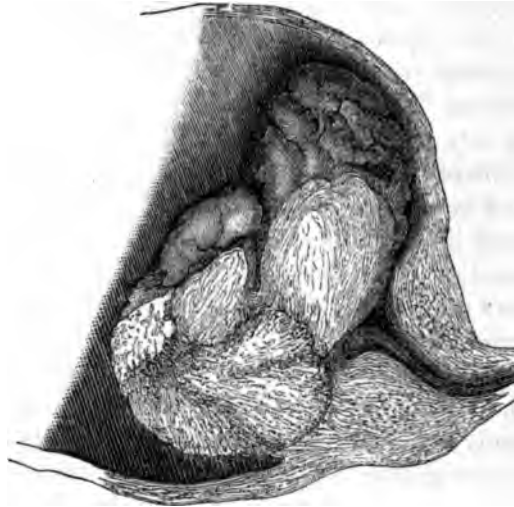
¹ Gazette Médicale de Paris, 1873, p. 410.

² Ibid., p. 332.

³ Op. cit., p. 109.

of eight examples recorded by Langhaus,¹ Bree,² Stafford,³ Langstaff,⁴ Solly,⁵ Adams,⁶ Isambert,⁷ and Bush,⁸ the respective ages were eight months, nine months, five, eight, three, three, eight and a half, and three years, the average being four years.

Fig. 121.



Sarcoma of the Median Portion of the Prostate.

Its progress is remarkably rapid, the duration of life from the appearance of the first symptoms to the fatal termination ranging from three to seven months, or four months on an average. It differs moreover from carcinoma in the uniform absence of lymphatic involvement, and in the almost universal freedom from secondary deposits in distant organs, the liver alone having been affected in one instance. The mass attains large dimensions in a very brief period, as, for example, the volume of a hen's egg in three months; or it may be as bulky as a child's

¹ Op. cit., p. 106.

² Provincial Med. and Surg. Journ., 1846, p. 76.

³ Med.-Chir. Trans., vol. xxii. p. 218.

⁴ Thompson, op. cit., p. 276.

⁵ Trans. Path. Soc. London, vol. iii. p. 130.

⁶ Anat. and Dis. of the Prostate Gland, 2d ed., p. 145.

⁷ Bull. de la Société Anat. de Paris, 1853, p. 57.

⁸ Gross, Urinary Organs, 2d ed., p. 719.

head, and fill the entire pelvis, as in the case of the infant eight months of age.

In its growth, the tumor may pursue various directions. Thus, it may advance forwards, so as to be felt in the perineum, where it may be mistaken for an abscess, and be punctured, and subsequently protrude as a fungous mass at the wound, as happened in the case of Langstaff. In other examples, it makes its way through the sphincter muscle of the anus, as was witnessed by Bree. It may also grow backwards and extend as high up as the promontory of the sacrum, as in the example of Langhaus; or it may take an upward course, so as to be perceptible above the pubes, as in the instances recorded by Solly and Isambert. Finally, it may project into the bladder, as in the case of Adams. In its earlier stages, little evidence of its existence is afforded by rectal palpation; but it may subsequently be detected in this situation, as a soft, elastic, lobulated mass. During the progress of the disease, the urethra is liable to alterations in its form and position; the bladder becomes inflamed and thickened, and the kidneys enlarge or suppurate.

In its minute and gross features, sarcoma of the prostate resembles the disease as it occurs elsewhere, but particularly in the testis. The specimen of Isambert was pronounced by Robin to be one of spindle-celled tumor; while that of Langhaus was a very vascular round-celled sarcoma.

The symptoms of sarcoma differ somewhat from those of carcinoma of the prostate. Dysuria and retention of urine are prominent signs, the latter occurring in every instance. It is rather more frequent late in the disease than as an early manifestation; and almost constantly demands the employment of the catheter, the introduction of the instrument being generally difficult and painful, and, in many cases, impracticable, thereby necessitating a resort to puncture of the distended bladder. Essential pain is not common. Suffering is provoked, however, by the passage of the catheter, the insertion of the finger into the rectum, and by downward pressure above the pubes. It occasionally occurs before, during, and after micturition, when it is also referred to the head of the penis. Hemorrhage is only witnessed after instrumental contact.

The diagnosis is based upon the presence of a soft, rapidly-growing tumor in front of the rectum, with coincident loss of

flesh and strength. Death ensues from exhaustion or uremia; although in the case of Solly, the fatal result was due to peritonitis, for which there was no assignable cause.

In the way of treatment, all that can be done is to relieve pain by anodynes, to draw off the urine as occasion may require, or, if catheterism be impossible, to puncture the bladder, and to support the failing powers by tonics, stimulants, and nourishing diet.

SECT. II.—TUBERCLE OF THE PROSTATE.

The prostate is occasionally the seat of tubercles. The affection, however, is extremely rare, and is almost invariably associated with similar deposits in other organs of the genito-urinary apparatus, as the urethra, bladder, kidneys, testicles, and seminal vesicles. In the majority of cases the lungs are also found to be invaded by tubercle. In a case, under my personal observation, it coexisted with psoas abscess. The patient was a tall, slender man, twenty-seven years of age, for the last four of which he had labored under spinal disease, from the immediate effects of which he finally died. The tubercles, eight in number, and about the size of a pea, were of a pale yellowish color, of a soft, curdy consistence, and scattered through different parts of the gland, which was at the same time considerably reduced in volume. Strumous matter was also contained in the seminal vesicles, in the right kidney, and ureter, and in the lymphatic glands of the pelvis. The lungs were entirely free from it.

The deposit occurs originally in the form of gray, miliary bodies, which are developed in the peritubular connective tissue. By their confluence, and by the progressive formation of new tubercles, they lead to masses as large as a pea, or even a chestnut. These subsequently become soft and cheesy, disintegrate, and form abscesses of variable size and number. In the instance reported by Lallemand, there were not less than thirty small abscesses of this nature. In other examples, there is only one sac, which is capable of holding several ounces, and its tendency is to evacuate itself into the urethra, the bladder, the rectum, or even into the peritoneal cavity.

The volume of the prostate in this affection is usually diminished. The deposit seldom occurs in children; but about one-

half of the cases are met with in young adults, and six per cent. in individuals after the seventieth year.

The symptoms are not characteristic, being merely those of chronic prostatitis. When ulceration or abscess occurs, the progress and termination are the same as in similar affections resulting from ordinary causes. An irritable condition of the bladder, purulent urine, hematuria, a tender condition of the organ, as indicated by the sound and by rectal touch, along with emaciation, debility, and other evidences of pulmonary tuberculosis, afford presumptive evidence of the affection.

When the character of the disease is suspected, recourse is had to the general remedies for phthisis, aided by counter-irritation to the perineum. Instrumental exploration should be avoided, as it not only aggravates the affection, but is liable to lead to acute suppuration and other evil consequences.¹

¹ In an emaciated man, sixty years of age, who was under the charge of the editor, at the Philadelphia Hospital, during the past winter, an attack of retention of urine required the use of the catheter. Examination with a No. 17 exploratory bougie had imparted to the touch the sensation of strictures at 5½" and 6" from the meatus. He was seized with a chill in twelve hours, which was rapidly followed by symptoms of acute suppression of urine, and death in forty-eight hours. Section disclosed numerous miliary tubercles in the bulbous, membranous, and prostatic portions of the urethra, with similar and abundant deposits in the enlarged prostate. The bladder was in a condition of concentric hypertrophy; but its muscular fibres were completely stripped of their mucous covering. Both kidneys were the seat of cheesy deposits and minute abscesses. The lungs were everywhere pervaded by tubercles and cavities, and the costal and pulmonary pleuræ were extensively adherent.

CHAPTER VI.

CONCRETIONS AND CALCULI OF THE PROSTATE.

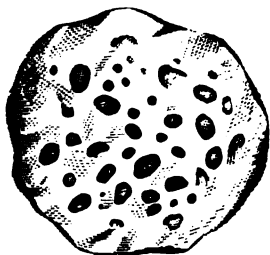
THE prostate, like other glandular organs, is liable to the formation of concretions and calculi, which often become a source of severe suffering, imperiously demanding surgical interference. They are entirely different, both in their structure and composition, from vesical concretions, and appear to be the result of disordered follicular secretion.

Old persons are most prone to the formation of small concretions; and there are few examples of hypertrophied prostate in which they are absent. They may, however, occur at any period of life, save early boyhood; but they are rarely found before the twentieth year. In their number, the concretions vary from a solitary one to several hundreds, while their volume rarely exceeds that of a pin's head. Now and then they appear as large as a pea; but in this event, they really consist of numbers of smaller ones united by mucus. The annexed engraving, from Marcet, conveys a good idea of the size and form of these little

bodies. They exhibit no uniformity in respect to their color. The most common tints are brownish, reddish, amber, or deep-yellow; and their consistence varies from that of suet to stone. In their structure, they are usually laminated. Marcet and other chemists long ago ascertained that these concretions consist essentially of phosphate of lime and organic matter. Iverson,¹ who has recently made a quantitative analysis,

states that there are contained in 100 parts 8 of water, 15.80 of organic matter, 37.64 of lime, 2.38 of magnesia, 1.76 of soda, 0.50 of potassa, 33.77 of phosphoric acid, and 0.15 of insoluble material.

Fig. 122.



Prostatic Concretions.

¹ Maly's Jahresbericht, 1875, p. 358.

Prostatic concretions are originally formed in the follicles and ducts of the organ, as represented in fig. 123 from Socin, from which they escape, in whole or in part, being visible, on dissection, in the orifices of the ducts, or just beneath the mucous

Fig. 123.



Two Concentric Concretions in the Prostatic Ducts.

membrane of the urethra, or in the parenchyma of the prostate, into which they have intruded by ulcerative absorption. Microscopical concretions are normal constituents of the prostatic fluid, even in young lads, their number increasing with the age of the individual. They appear to arise from inspissation of the secretion, by the separation of a peculiar organic substance, and probably amyloid transformation of the epithelial cells of the tubules and acini. Their tendency is to set up irritation, causing a deposit of phosphates, through which they become more dense and firm.

When their number is considerable, they are liable to break down the intervening structures, and become aggregated together. In this way, a large fibrous cyst is sometimes formed, in which the concretions lie like shot in a bag. A single sac of this description occasionally contains as many as sixty, or even several

hundred concretions, from the dimensions of a mustard seed to those of a pea, and intermixed with thin, glairy mucus.

By the coalescence of these small bodies, and the further deposition of earthy salts, prostatic calculi, properly so-called, are formed, which have been shown by Lassaigne to consist of 84.5 parts of phosphate of lime, 0.5 of carbonate of lime, and 15 of animal matter. Their composition would thus seem to be almost identical with that of salivary calculi. In their volume, they rarely exceed the size of a pea; but they have been found of the size of a hazel-nut, a chestnut, or even a pullet's egg. In a remarkable case, represented in fig. 124, and observed by Dr.

Fig. 124.



Prostatic Calculus.

Barker,¹ of Bedford, England, the calculus weighed three ounces and a half, and consisted of twenty-nine distinct pieces, of a whitish color, and porcelainous lustre and hardness, closely soldered together, and measuring nearly five inches in length, by four inches and five-eighths, at the thickest part. It was removed from a man, aged twenty-six, who had labored under incontinence of urine ever since his fourth year.

Their figure, especially when they are solitary, is usually more or less rounded; if, however, they are numerous, they are apt to be polyhedral, or faceted; in some instances, they are flattened on the sides like a grain of corn; now and then they are elongated, pear-shaped, conical, cuboidal, ramiform, or narrow and constricted at the middle, like an hour-glass. In the case of a young man of twenty, I found them of a regular pyramidal figure. When there is only one concretion, the surface is generally rough, or finely tuberculated; if, on the contrary, they are numerous, it is always smooth and polished; an appearance evidently produced by their mutual friction. In some instances, the calculi are, as it were, articulated together, the rounded ex-

¹ Trans. Prov. Med. and Surg. Assoc., N. S., vol. iii. p. 235.

tremity of one being received into a corresponding concavity of another. Their consistence is hard, emitting, when struck by a sound, a clear ringing note. In color, they are white, or pale-brown, their interior being a few shades lighter than the surface.

During the progress of their development, these bodies are liable to produce absorption of the surrounding parts, and to change their situation. Thus, some of them may escape entirely from the gland, and either fall into the bladder, to become the nuclei, perhaps, of a corresponding number of urinary concretions, or they may be passed with the urine. Some, again, may become impacted in the orifices of the excretory ducts, or in some abnormal aperture, and project upon the free surface of the urethra, either at its prostatic or membranous portion. Lastly, when they are situated towards the back part of the gland, they may, by continued ulcerative absorption, finally escape into the connective tissue between it and the rectum, making their way into the bowel or escaping externally through an abscess in the perineum.

Calculi, resembling those now described, are occasionally found in the ejaculatory ducts, which traverse the prostate from behind forwards. It is not probable, however, that they are of the same character; on the contrary, it is more reasonable to conclude that they are derived from the seminal vesicles, which, as is well known, are sometimes, although rarely, the seat of a peculiar form of concretion. I have myself seen one well-marked example of this, in a young man of twenty.

There is no uniformity in the effects produced by these bodies, either upon the urinary passages, or upon the system at large. When small, they seldom cause much uneasiness, sometimes, indeed, not the slightest, and it is, therefore, not surprising that their presence should often be overlooked during life. This may be the case, even when they exist in considerable numbers. At times, however, they are productive of great inconvenience, if not of excessive suffering. One of the most common symptoms is a dull, aching, wandering pain, with a sense of uneasiness in the perineum and neck of the bladder; this is frequently attended with difficult micturition, and is liable to be aggravated whenever there is the most trifling derangement of the general health. During the progress of the disease the bladder becomes highly irritable; there is a constant desire to urinate, and the water is

loaded with thick, glairy mucus, very much as in catarrh. Occasionally the concretions encroach so much upon the prostatic portion of the urethra as to give rise to partial, and sometimes even complete retention of urine. In a case mentioned by Sir Astley Cooper,¹ the calculi, of which there was an immense number, produced not only painful feelings in the perineum, but a degree of irritation which kept the patient in a state of continual mental excitement, bordering on insanity. The suffering occasioned by these bodies is usually not constant; on the contrary, after having persisted for some time, it may cease altogether, or recur only at long intervals.

Little need be said respecting the general symptoms of prostatic calculi, as they do not, usually, differ materially from those which accompany stone in the bladder. The health frequently continues good for many years, with the exception, perhaps, of an occasional paroxysm of fever, loss of appetite, and disorder of the bowels. By and by, however, it begins to decline, and at length, after years of suffering, it is completely shattered. A young man of twenty, whom I attended some years ago, suffered as severely as any human being possibly could from this disease, under which he had labored from early infancy. He was literally reduced to a skeleton, and had not strength enough to walk across his room. He had an incessant desire to void his water, with excessive scalding and burning of the urethra, and was constantly pulling at his prepuce, which was the seat of a most distressing pain and itching. I sounded him repeatedly without detecting any stone in the bladder, the coats of which were evidently much thickened, and the capacity greatly diminished. In the prostatic portion of the urethra the instrument always encountered a mass of hard substance, emitting a distinct noise, and easily felt by a digital exploration of the rectum. On one occasion I detached several calculi, which were afterwards excreted with the urine, and were found to be of a regular pyramidal shape, smooth and polished on the surface, of a dark brownish color, and of the size of a very small grain of corn. The patient was too much exhausted to justify an operation, and I therefore sent him home, where he soon after died. His body was not examined.

From the preceding remarks it will be perceived that the

¹ Lectures on Surgery, by Tyrrell, p. 321. Phila., 1835.

diagnosis of prostatic calculi is by no means always easy. The rational symptoms are, in truth, of little account in the determination of the question; for, like those of vesical calculi, they may be simulated by other affections in so embarrassing a degree as to render them utterly worthless. It has already been seen that the detection of these bodies, even when they exist in considerable numbers, is often entirely fortuitous. They are particularly liable to be overlooked when they occur in union with urinary calculi, stricture of the urethra, or hypertrophy of the prostate. When bulky or numerous, or when many of them are aggregated together, and lodged in a large cyst, or finally, when they project, as they now and then do, upon the free surface of the urethra, or into the bladder, they may be detected by a digital examination of the rectum, and the introduction of a sound, bougie, or catheter. As the instrument glides along, it rubs against the foreign body, and imparts to the fingers a distinct grating sensation. If it consist of steel, the concretion may not only be felt, but it will be apt, if struck, to yield a sharp, metallic click, similar to that elicited by the contact of the sound with a urinary calculus. If a smooth wax bougie be used, its surface will sometimes be rendered rough by its collision with the extraneous body.

When the finger is introduced into the rectum, the prostate being at the same time pressed backwards with a sound or silver catheter, the concretions may often be felt as so many hard, irregular projections, the position of which remains unchanged by any force that can be applied to them. When a considerable number are collected together in a nest, they give the finger the feel of a bag of marbles, of a mass of clotted blood, or of a bag of air; and, if struck with a sound, they produce a sort of dull, jarring, crepitating noise. Sometimes a concretion of this kind is discharged along with the urine, when a careful examination of its character promptly reveals its true nature and origin. In all cases of doubt, chemical tests should be employed.

Another sign upon which great reliance is to be placed, is the circumstance that the concretion can be felt only in one particular spot, and that it is generally immovably fixed, or nearly so. Whatever posture the patient may assume, the situation of the foreign body remains unaltered. In this respect, a prostatic calculus differs remarkably from a vesical calculus, which is

liable to change its situation not only with every variation of posture, but also according to the state of repletion and vacuity of the bladder.

Prostatic calculi are usually associated with disease of the urinary apparatus, as stricture of the urethra, enlargement of the prostate, stone in the bladder, hypertrophy of the muscular coat of the bladder, and organic lesion of the ureters and kidneys. The gland in which they are situated is not always hypertrophied; on the contrary, it is sometimes considerably wasted, and even entirely changed in its substance, being converted into a thin, fibrous shell, destitute, in great degree, of the normal structure. Its consistence, in this affection, may be natural, diminished, or augmented. The concretions may occur in any part of the gland, and sometimes they are scattered through its entire substance. Occasionally, although rarely, they are found almost exclusively in the middle lobe, which is then in a state of hypertrophy. A single calculus sometimes extends from the prostate forward into the membranous portion of the urethra, which is thus often dilated many times beyond its natural caliber.

In the treatment of prostatic calculi, not much is to be expected from the employment of internal remedies, beyond the good effects which they may exert upon the general health, which must, of course, always receive due attention. Any complications that may exist must be met upon general principles; stricture of the urethra must be removed, vesical calculi extracted, morbid sensibility of the bladder corrected, the bowels opened, and the diet regulated. To counteract the tendency to phosphatic deposits, the different acids, especially the nitric, must be put in requisition, either singly, or jointly with infusion of uva ursi and hops. Alkalies are sometimes indicated.

The radical treatment, which is, of course, purely mechanical, must be regulated by circumstances. When the calculus projects into the urethra, it sometimes admits of being detached with the sound or catheter, and pushed back into the bladder, from which, if it be not too bulky, it is afterwards discharged along with the urine. To facilitate the separation it will be found useful to introduce the finger into the rectum, so as to steady the gland, and bring it thus more fully within reach of the instrument. When the concretion projects from the gland, but

is firmly fixed in its substance, an attempt may be made to seize and extract it with the urethral forceps, or cuvette, employed upon the same principle as in calculus of the urethra. Civiale and others have repeatedly succeeded in dislodging phosphatic concretions with the litholabe, first detaching them, and then removing them either whole or piecemeal, as in the operation of lithotrity.

When the calculi are encysted, or contained in a bag in the parenchymatous substance, the only way in which they can be approached is to cut down to the organ upon the staff, as in the ordinary operation of lithotomy. The operation is not difficult; nor is it attended or followed by any ill effects. When the concretion is of large size, and projects forward into the urethra, so as to prevent the possibility of introducing the staff, the lateral operation should give way to the median, as was long ago advised by Dionis.¹ In case there are several cysts, situated in different parts of the prostate, a corresponding number of incisions may be required, and these may be made either at the same or at different periods. Before resorting to an operation of such magnitude and importance, the surgeon should always determine, if possible, the precise locality of the foreign bodies; otherwise, after he has made the necessary incisions, he may experience much difficulty in finding the object of his search, or be greatly embarrassed, if not completely foiled, in his attempts at extraction. Occasionally the calculi lie in the connective tissue between the prostate and the rectum, having passed thither by ulcerative absorption. In such a case, instead of cutting through the perineum, as under ordinary circumstances, I should prefer making a prerectal curvilinear incision.

¹ *Operations de Chirurgie*, par La Faye, p. 221.

CHAPTER VII.

HEMORRHAGE OF THE PROSTATE GLAND.

THE prostate gland, like other parts of the body, is liable to hemorrhage, varying in degree from a few drops to several ounces. The occurrence, however, is extremely rare, and is chiefly met with in aged subjects, in consequence of the forcible use of instruments, leading to a laceration of the substance of the organ, or to a rupture of some of its vessels, which, at this period of life, are frequently in a state of enlargement and varicosity. Catheterism, under such circumstances, even when performed with extreme delicacy and gentleness, is liable to be followed by a copious flow of blood. In old persons affected with hypertrophy of the gland, riding on horseback, venereal indulgence, a fall on the buttock, or a blow upon the perineum, will occasionally give rise to this form of hemorrhage, which, although generally slight, may be so abundant as to create no little uneasiness for the patient's safety. A smart bleeding of the prostate is sometimes produced by the irritation of a calculus, either of the bladder, or lodged in its own substance. The hemorrhage is occasionally spontaneous, and then probably depends upon ulceration of the organ, a granular condition of its surface, or the presence of a sarcomatous or carcinomatous tumor.

Hemorrhage of the prostate is generally difficult of recognition, owing to its liability to be confounded with hemorrhage of the bladder and the urethra. When the blood proceeds from the prostate, a portion generally escapes in a pure state, free from urine, both before and after the evacuation of the bladder, while that which passes into the bladder is of a dark muddy appearance, and is voided during micturition. These phenomena, however, are not characteristic, and it is only by coupling with them the history of the case that they assume a diagnostic value. Thus, if along with an escape of blood from the urethra or bladder, the patient is conscious of having received an injury

either by a blow on the perineum, or by the introduction of an instrument in the region of the prostate, the probability is that it proceeds from this gland, and not from the urinary passages, properly so termed. When the hemorrhage is caused by an ulcer of the prostate, or the presence of a tumor, the circumstance is, in general, easily determined by the sound or catheter.

The prognosis of this variety of hemorrhage is favorable or otherwise according as it is simple or traumatic, or dependent upon ulceration of the gland, or the presence of malignant disease. In the former case, it is generally readily amenable to treatment, and, therefore, free from danger; in the latter, it is commonly obstinate, and irremediable.

The treatment of hemorrhage of the prostate is to be conducted upon the same principles as that of hemorrhage of the urinary passages generally. In many cases, it ceases spontaneously, or readily yields to rest in the recumbent posture, cold applications to the perineum, and iced, acidulated drinks. Where these means fail, or where the bleeding is at all copious, recourse is to be had to the exhibition of gallic acid, in union with opium, every two or three hours, in the proportion of two or three grains of the former to half a grain of the latter. Few cases resist this combination beyond ten or twelve hours, and in many instances it arrests the discharge much sooner. When gallic acid fails to afford relief, acetate of lead, alum, sulphuric acid, spirit of turpentine, ergotine, and the tincture of the chloride of iron, may be used as substitutes, with a reasonable hope of success. As adjuvants, cold applications to the anus, perineum, and the hypogastric region should not be neglected.

Sometimes marked relief has followed the exhibition of Ruspini's styptic. In a case treated by Mr. Brodie,¹ in which a frightful hemorrhage was connected with a very diseased prostate, it promptly arrested the discharge after all other remedies had failed.

¹ Brodie's Select Works, p. 100. Phila., 1847.

CHAPTER VIII.

WOUNDS OF THE PROSTATE.

WOUNDS of the prostate are the result either of accident or design. In the latter case, they are made by the surgeon with a view to the accomplishment of some useful purpose, as the extraction of a stone or the evacuation of the urine. However induced, they vary in extent and importance, from a mere scratch, as it were, to the complete division of the organ. In respect to their character, they are of different kinds, as incised, lacerated, punctured, and gunshot, as in other parts of the body.

The best example of an incised wound of this gland is that which occurs in the lateral operation of lithotomy, in which the organ is always divided on one side, generally the left. The extent of the wound varies in the hands of different surgeons, some being in favor of a small, others of a free division. The subject, which is of great practical importance, has been discussed elsewhere, and need not, therefore, detain us here.

Lacerated wounds, which partake also of a punctured nature, of the prostate are generally produced by the forcible or incautious use of instruments in attempting to draw off the urine. Any portion of the gland may suffer in this way, but the one which is most liable to be injured is the middle lobe, which, from its size and situation, often forms a serious obstacle to the evacuation of the bladder, and therefore is most commonly perforated by the catheter. The whole gland is sometimes accidentally bored, if such an expression is allowable, in this manner, without being followed by any serious mischief, much less by loss of life. False passages of the prostate, as these perforations may be appropriately denominated, are, however, sometimes dangerous from the manner in which they interfere with the neighboring parts. When they penetrate the pelvic fascia they are liable to be followed by violent inflammation and death. A perforation of this kind sometimes extends into the rectum, and leads to the formation of a fistule. It occasionally happens that

the passage becomes lined by a false membrane, and assists in conducting the urine into the urethra.

Shot wounds of the prostate are exceedingly rare. They are always complicated by fracture of the pelvic bones, or by injury of the urethra, bladder, penis, rectum, or the bloodvessels. Of the seven cases recorded during our late war, three recovered, but the subjects suffered either from a constant escape of urine through the wound, or from urethro-rectal fistule.

The most prominent effects of wounds of the prostate are: hemorrhage, which, however, is seldom considerable; inflammation; infiltration of urine and sloughing; retention of urine from tumefaction of the affected parts, and the pressure which they exert upon the lumen of the prostatic portion of the urethra; urethro-rectal fistules; and abscess, situated either in the substance of the organ, or between the gland and the rectum.

Wounds of the prostate, especially when unattended by lesion of the integuments, must necessarily be more or less obscure in their character, if not wholly beyond our power of diagnosis. This being the case, little need be said on the subject of treatment, beyond the fact that this should be conducted upon general principles. From the great liberty which we may take with this gland, the slight pain which attends its injuries, and the little sympathy which it enjoys with the rest of the system, or even the parts with which it is more immediately associated, it is obvious that ordinary wounds, whether incised, lacerated, contused, or punctured, are generally amenable to the common antiphlogistic means, and that there is much less reason to dread them, in relation to inflammation and its effects, than the surrounding structures.

Wounds of the prostate are sometimes attended by troublesome hemorrhage, especially in elderly persons. As there are no large arterial trunks from which the bleeding can proceed, it is not improbable that it emanates, under such circumstances, from the prostatic plexus of veins, which are often varicose and much increased in volume, particularly in calculous subjects, or in such as are affected with excessive enlargement of the prostate. A severe, and even fatal hemorrhage, however, might be caused by the division of an anomalous artery, which occasionally passes along the side of this gland, on its way to the penis, and which has been cut, in one instance, at least, in the lateral

operation for stone. From whatever source the hemorrhage arises, it is obvious that our chief reliance for arresting it must be placed upon compression, since it would be folly to attempt ligation. The manner of applying compression has been pointed out in connection with the operation of lithotomy, and need not, therefore, detain us here.

CHAPTER IX.

MALFORMATIONS OF THE PROSTATE.

THE only anomaly of the prostate which is of the slightest practical importance, is that known as congenital aberration, or ectopia, of the anterior middle lobe or commissure, to which attention was first called, in 1865, by Professor V. Luschka,¹ of Tübingen, who pointed out its connection with fistule of the penis. The case was that of a suicide, nineteen years of age, on the back of whose penis, near the pubes, there was an opening about the sixth of an inch in diameter, which led into a canal, three-fifths of an inch long, and lined by a pale red mucous membrane. On laying this open, four excretory ducts were brought into view, which proceeded from an ovoidal gland, about one-fourth of an inch in its greatest diameter, reposing on the albugineous coat of the cavernous bodies, four-fifths of an inch in front of their angle of union. The posterior extremity of the gland was continuous with the detrusor muscle of the bladder through a long, filamentous tendon. In its structure, it was homologous with the tissues of the normal prostate, each lobe possessing its proper excretory duct, several of which contained microscopic concentric concretions.

From this case it would appear that some congenital fistules, at least, of the dorsum of the penis, must be regarded as examples of ectopia of ducts arising from an accessory prostate, or a misplaced portion of that organ. In an example recorded by Pribram,² the opening, which was seated on the back of the penis, an inch and a quarter behind the gland, gave issue to a few drops of prostatic fluid, during ejaculation, while the semen escaped by the normal urethra. Verneuil³ has reported an instance of gonorrhœa of the fistulous track in the same situation;

¹ Virchow's Archiv, Bd. xxxiv. p. 592.

² Prager Vierteljahrschrift, Bd. iv., 1867, p. 44.

³ Archives Générales, Ser. vi. t. vii., 1866, p. 670.

and Marchal,¹ and Picardat² noticed a similar phenomenon in two cases in which the urethra and fistulous opening presented the appearance of a double meatus. In the case of the latter observer, prostatic fluid was also ejaculated by the abnormal orifice.

¹ Bull. de l'Acad. de Méd., t. xvii., 1852, p. 640.

² Quoted by Verneuil, p. 663.

PART III.

DISEASES AND INJURIES OF THE URETHRA.

CHAPTER I.

FUNCTIONAL DISORDERS OF THE URETHRA.

SECT. I.—MORBID SENSIBILITY OF THE URETHRA.

HYPERÆSTHESIA consists mainly, if not exclusively, in an exaltation of the natural sensibility of the mucous membrane of the urethra, similar to that which is so frequently witnessed in the throat, larynx, urinary bladder, eye, and stomach. Both sexes are liable to it, but it is much more common in men than in women. It occasionally exists at a very early period, and is not unfrequently associated with the same complaint of the bladder.

It is not always easy, or even possible, to ascertain the nature of the exciting causes of this affection, so diversified are they in their character. In the male it is often dependent upon the effects of gonorrhœa and gleet, contraction of the meatus, phimosis, stricture of the urethra, and enlargement of the prostate gland; and, in both sexes, upon derangement of the bladder, the kidneys, ureters, anus, and rectum. *Ascarides* and other worms, ulcers, abscesses, fistules, hemorrhoids, polyps, and malignant tumors frequently occasion it. Excessive venery, onanism, and ungratified sexual desire may also be enumerated as so many exciting causes of the complaint. It sometimes attends inflammation, ulceration, and other disorders of the uterus, the vagina, and vulva. Vascular excrescences, whether situated within the canal, or clustered around the external meatus, often produce similar effects. Lesions of innervation, dyspepsia, and morbid states of the urine may not only induce it, but maintain it for an indefinite period. The probability is that certain occupations

predispose to its occurrence, as riding on horseback, constant sitting, and protracted standing. I have seen a number of cases of this kind in literary and hypochondriacal persons. Sometimes the origin of the complaint may be traced to the habitual use of certain articles of food and drink. Inebriates often suffer in this way. Of all the causes, however, onanism and inordinate sexual indulgence are, I have reason to believe, the most common.

The symptoms of this affection are subject to great diversity, both as it respects their nature and degree. In the more simple forms, there is merely a slight exaltation of the normal sensibility of the mucous membrane, as evidenced by a sense of titillation, slight scalding in micturition, and a feeling of soreness along the lower surface of the penis during erection or copulation. When the affection is more fully developed, the local distress is not only more severe but more constant and diffused, often extending to the surrounding parts, as the perineum and anus, the groins, the pubes, and the genital organs, which are not unfrequently, in this event, the seat of dull, heavy, aching, or of sharp, darting pains, similar to those of neuralgia. The bladder is also liable to suffer, sometimes sympathetically, and at other times from a positive extension of the disease. The desire to micturate increases in frequency, and as the urine flows along the affected surface of the urethra it gives rise to a burning or scalding sensation. Occasionally the symptoms resemble those of stone in the bladder. When the disease exists in this aggravated form, there is always marked disorder of the general health; the appetite is deranged, the bowels are constipated, the countenance is haggard and woe-begone, the extremities are habitually cold, the body is easily impressed by atmospheric vicissitudes, the mind is peevish and fretful, and the slightest indiscretion in eating and drinking is sure to augment the local distress. Vague and indefinable sensations are experienced, not only in the urethra and in the rest of the genito-urinary apparatus, but in other regions and organs, and, as they always have a tendency to alarm the patient and absorb his attention, they are generally a source of real suffering. When the posterior portion of the urethra is involved, seminal emissions are apt to take place, and there is also frequently an unusually abundant flow of prostatic mucus. When the affection is associated with gleet, there will commonly be a

slight puriform discharge, or an appearance of little flakes resembling fragments of boiled rice. The urine is variously altered in its properties; in general it contains an undue quantity of mucus, and not infrequently it exhibits under the microscope different deposits, especially oxalate of lime and phosphates.

Hemorrhage occasionally attends this affection, but the occurrence, if I may judge from my own observation, is infrequent; nor is the loss of blood at any time abundant. A distinguished physician of North Carolina, who has long been a martyr to this complaint, informs me that he has had repeated attacks of this kind, some of which had lasted a number of days, before they finally yielded to treatment. He speaks of several other cases in which he has witnessed the same phenomenon. The blood sometimes comes away in a pure state, but more commonly it is mixed with the urine, to which it serves to impart a dirty, dingy, red appearance, which vanishes the moment the hemorrhage ceases. It is not always easy, in these attacks, to determine the seat of the bleeding, whether it is in the urethra, the bladder, the ureters, or the kidneys, as the diagnosis is generally obscure, if not altogether impracticable. In the case of my medical friend, the greatest amount of distress is in the prostatic portion of the urethra, but he also experiences much uneasiness in the bladder, penis, and sacrolumbar region, where there is often a heavy, burning, or dragging sensation. Sometimes, his whole spine is tender; the genital organs are cold and numb; and there is often a feeling in the rectum, similar to what might be supposed to be caused by the presence of a large foreign body. His last attack of hemorrhage continued thirty-six hours, and was promptly relieved by gallic acid, in doses of three grains, repeated every three hours.

The best mode of determining the precise nature of this disorder is the introduction of the catheter. One of medium size is selected and is passed with the greatest care and gentleness, otherwise it will be sure to excite severe pain and spasm. Proceeding in this manner, the operator ascertains both the extent and the degree of the morbid sensibility; whether it is limited to a portion of the canal, or whether it is diffused over its whole length and breadth; whether it is slight or severe; and, finally, whether it is simple, or complicated with stricture of the ure-

thra, enlargement of the prostate gland, or disease of the bladder.

To form a correct estimate of the value of such an examination, the attendant should recollect that the introduction of the catheter, especially if performed for the first time, may, even in the healthy state, be productive of considerable uneasiness, if not of positive pain. Sometimes, indeed, the distress is so great as to induce swooning, or, at all events, a disposition to syncope, with severe prostration of the vital powers, as is indicated by the feebleness of the pulse, the pallor of the face, and the abundant sweats, together, perhaps, with the occurrence of rigors. The greatest amount of sensibility, in the normal state, commonly exists at the curve of the urethra, at the bulbo-membranous portion; a good deal is also generally found just behind the head of the penis; and occasionally it is very remarkable at the very commencement of the canal. The edges of the meatus are often quite sensitive, especially when the orifice is unnaturally small and tight. The sensibility of the canal is greatest, other things being equal, in infancy, childhood, and adolescence, and least in old age.

The true pathology of this disease is not accurately determined. There is no doubt that it is occasionally caused by inflammation, either subacute or chronic in its character; but very frequently it exists entirely independently of this lesion, and appears to be merely an exaltation of the normal sensibility of the mucous membrane, unaccompanied even by the slightest congestion of the capillary vessels.

The treatment of this affection cannot always be conducted upon strictly scientific principles, since, as already stated, it is often extremely difficult to determine its true character. In all cases, it is a matter of paramount importance to inquire into the nature of the exciting cause, and the existence or absence of complications. If the cause be appreciable, or still in operation, it should, if possible, be removed, otherwise no mode of management, however energetic or judicious, will be likely to afford any permanent benefit.

In general, marked relief will follow the use of antiphlogistics, especially if the disease be attended with an increased discharge of mucus, of puriform matter, or of pus, as will be apt to be the case when it has arisen from stricture of the urethra, gonorrhœa,

or chronic enlargement of the prostate gland. The bowels should be well moved with mild but efficient purgatives; the diet should be bland and restricted; and free use should be made of the antimonial and saline mixture. The system having thus been reduced, the disease will usually promptly disappear under the use of bicarbonate of soda, either alone or in union with uva ursi and hop-tea, mild laxatives, and anodyne injections, with the addition of a small quantity of Goulard's extract. When the patient is dyspeptic, or of a broken-down constitution, a course of blue mass and ipecacuanha, tonics, and a generous diet may be necessary, along with cold bathing, the use of alkalies, and exercise in the open air.

The introduction of a full-sized steel bougie, at first once, and afterwards twice a day, is sometimes productive of the best results. Of the beneficial effects of this treatment I might, if space permitted, adduce numerous cases. The pressure which the instrument exerts upon the walls of the canal soon blunts their sensibility and often acts like a charm in dislodging the disease. In this way, moreover, the affected surface may be directly medicated, by anointing the instrument with various unguents, especially the dilute ointments of the nitrate of mercury and belladonna, which are entitled to the first rank in the list of this class of remedial agents. When the morbid sensibility is connected with involuntary seminal emissions, hardly anything short of cauterization of the prostatic and membranous portions of the urethra will be likely to succeed. Sometimes, indeed, it is necessary to cauterize the canal in its whole length. When the disease proves very obstinate and intractable, a blister may be applied to the perineum, or, what is better, along the under surface of the urethra. Few cases will be able to withstand this remedy. Whatever mode of treatment be adopted, the patient should carefully refrain from sexual indulgence and exercise on horseback; nor should he allow himself to become too easily discouraged if our efforts to relieve him are not speedily crowned with success.

When the exciting cause of the complaint is not appreciable, the best internal remedy is the bromide of potassium, in doses of thirty grains every eight hours. It not only corrects the acidity of the urine, but seems to exert a sedative impression upon the urethral mucous membrane.

SECT. II.—NEURALGIA OF THE URETHRA.

Neuralgia of the urethra occasionally exists at an early period of life, but is most common after the age of puberty, in young persons of a nervous, excitable temperament. It is much more frequent in males than in females. Its origin is generally obscure; sometimes it is traceable to external injury, as a bruise, or to the lodgment of a calculus; sometimes it manifestly depends upon onanism, or excessive sexual intercourse; now and then it follows an attack of gonorrhœa, orchitis, or disorder of the bladder, prostate, ureter, or kidney. In the southwest, where this affection is not infrequent, it is often dependent upon a miasmatic impregnation of the system, and may, therefore, be said, under such circumstances, to have the same origin as intermittent fever. In the female, I have known neuralgia of the urethra to be connected with hysteria and dysmenorrhœa. In many cases, the disease is associated with neuralgia of other parts of the body, especially of the head, chest, and back.

The manner in which this disease makes its appearance is variable; being sometimes sudden and unexpected, at other times gradual, and preceded by a sense of fatigue, soreness, or uneasiness in the affected part. The pain is of a sharp, pricking character, darting about in different directions with the rapidity of lightning; it often remits or even intermits for a few seconds, and then recurs with its former violence; it is generally attended with considerable soreness of the urethra and penis, a frequent desire to micturate, and more or less scalding in voiding the urine. Occasionally the disease is strictly periodical in its attacks, coming on at a particular time of the day, lasting an hour or two, and then gradually declining, to reappear about the same time the next day. In some cases, it assumes the tertian or quartan type. Distinct chilly sensations occasionally mark its access, especially when it is of miasmatic origin. The following case, one of many that have occurred in my practice, affords a good idea of the nature of this affection.

T. C. II., a student of medicine, twenty-six years of age, of temperate habits, and good constitution, was seized on the 12th of January with a frequent and urgent desire to micturate, attended with a scalding sensation of the urethra, which was at the time entirely free from disease. Indeed, the patient had

never had an attack of gonorrhœa, nor was he conscious that the parts had ever been injured in any way whatever. Although he had no difficulty in emptying his bladder, he found that voiding his urine neither relieved the desire to pass this fluid, nor put a stop to the pain, which was of a darting, pricking character. Being in good health in other respects, he supposed that the symptoms would soon disappear, and therefore contented himself with a large dose of paregoric, under the influence of which he passed the night comfortably enough. In the morning the pain was gone; but, to his surprise, it returned late in the afternoon, and from that time on it assumed a periodical type, recurring regularly about the same hour every day. Thus it continued for a week. The general health, in the meanwhile, appeared to be excellent; the appetite was good, the urine retained its normal character, and all the functions seemed to be well executed. Satisfied, from a careful examination of the case, that the disease was neuralgia, I put the patient at once upon the use of quinine and arsenious acid, giving him four grains of the former with the tenth of a grain of the latter, every five hours. At bedtime he took blue mass and rhubarb in sufficient quantity to move his bowels. Under the influence of this treatment, aided by proper diet, the disease promptly lost its periodical character, and became, in every respect, mitigated. In ten days, the patient was so much relieved as to be able to go to the lecture-room, having still, however, a slight burning sensation in the urethra. Supposing that this would disappear spontaneously, he discontinued his medicine, and resumed his accustomed mode of living. On the 6th of February, the pain returned with some severity, but not, as before, in regular paroxysms. The same prescription, with the addition of the sixteenth of a grain of strychnia, was ordered, and steadily persisted in until the 13th of the month, when all the symptoms had disappeared. To guard against relapse, the use of the medicine was resumed in five days, and continued for forty-eight hours, when it was finally laid aside: the cure being apparently complete.

Neuralgia of the urethra is often a troublesome and obstinate, although never a fatal, disease. I have known it to continue for years, not steadily but intermittingly, and finally to disappear quite suddenly, without any evident cause, or without any particular treatment. The disease is most apt to prove obstinate

when it coexists with neuralgia of other parts of the body, when it occurs in persons of a nervous, irritable temperament, or when it is associated with organic lesion of the genito-urinary apparatus.

The treatment is to be conducted upon the same principles as that of neuralgia in other parts of the body. The cause is, if possible, removed; after which recourse is had to quinine, arsenic, strychnia, ergotine, and aconite, variously combined, and persistently exhibited, their effects being duly watched, both by the patient and his attendant, for fear of overdosing. When the affection is of a purely miasmatic origin, no other treatment is generally required; a few days suffice to mitigate the morbid action, and a few more to dispel it. In rare cases, long continuance of treatment is necessary, and, in all, care should be taken to guard against relapse. The bowels should not be neglected; the diet should be properly regulated; and the patient must avoid exposure to cold and wet. In the milder forms of the disease, quinine alone will often speedily effect a cure; but, in general, I combine with this substance some or all of the articles above mentioned. In obstinate cases, valerianate of iron sometimes succeeds when all other remedies fail.

Little is necessary in the way of local treatment. During the paroxysm, the penis may be immersed in warm water, or fomented with hot cloths, impregnated with laudanum; or, better still, the patient may use a hot bath, and an anodyne enema. These measures are particularly indicated when the pain extends to the neck of the bladder, or when the attack is attended with a frequent desire to micturate, a sense of scalding along the urethra, and great uneasiness in the head of the penis. The application of veratria and belladonna ointment is sometimes of service, in mitigating the local distress and reëstablishing healthy action. In some cases I have witnessed good effects, especially in cold weather, from making the patient constantly carry his penis in a thick flannel stall, to protect it from atmospheric vicissitudes, which, as is well known, exert a most powerful influence over neuralgic diseases, in whatever part of the body occurring. The organ should be habitually elevated, and care be taken that the pantaloons do not exert any undue pressure upon it. It need scarcely be said that all sexual excitement should be avoided.

. SECT. III.—SPASM OF THE URETHRA.

Spasm of the urethra is characterized by transient signs of obstruction of this passage, which, in the interval between the attacks, possesses its normal degree of dilatability, while the stream of urine retains its natural size. In these respects, spasmodic stricture, as this symptom is usually termed, differs from the permanent or organic form of the affection, in which the urethra and the stream of urine are permanently narrowed.

Depending as it does upon reflex muscular action, spasm of the urethra is readily excited by any cause which acts upon the sensory nerves of the mucous membrane, through which the involuntary and voluntary muscular fibres which encircle the canal are thrown into a state of cramp, in the same manner that the muscles which move a joint contract in certain arthritic affections. Hence, of the local exciting causes, the most fruitful are morbid sensibility, inflammation, organic stricture, phimosis, venereal excesses, the presence of a calculus or other foreign substance, lacerations, abrasions, ulcers, cutting operations, cauterization, the passage of acrid or acid urine, especially in gouty or rheumatic subjects, the effects of cantharides, turpentine, and alcoholic drinks, and long-continued voluntary retention of urine. Of the general causes, or those which are independent of a sensitive state of the urethra, or of an altered condition of the urine, the most common are affections of, and operations on, the anus, rectum, and uterus, derangements of the digestive and nervous systems, and mental emotion.

The symptoms of spasm of the urethra are frequent, difficult, and painful micturition; diminution in the size of the stream of urine, which is voided in feeble jets or by drops; and retention, when the attack is aggravated. They usually come on suddenly and in quick succession, generally from exposure to cold, or intemperance in drinking, especially if the canal have already been in an irritable condition, and they are liable to pass off as rapidly as they appeared. When the mucous membrane of the urethra, however, is abnormally sensitive, the attack may last for many days; and, in this event, symptomatic fever declares itself.

The transient nature of the attack, taken in connection with the fact that there is neither permanent narrowing of the urethra nor diminution in the size of the stream of the urine, is

sufficient to distinguish spasm from organic stricture, which is the only affection with which it is liable to be confounded.

The treatment is palliative and radical. To overcome the spasm nothing is usually required beyond the introduction of a full-sized catheter. As soon as it is gently pressed against the seat of the obstruction, which is generally at the bulbo-membranous junction, the consentaneous action of the muscles is restored, the compressor muscle of the urethra relaxing, while its opponent, the detrusor muscle of the bladder, contracts, and the urine is voided. In the absence of the catheter the most reliable remedies are the hot bath and a hypodermic injection of morphia, or twenty grains of Dover's powder.

The radical treatment is based upon the removal of the exciting cause, the obtunding of the sensibility of the mucous membrane of the urethra by the passage of steel bougies, and the employment of the measures referred to in a previous section. The bowels must be kept open; the diet should be regulated, all stimulating and acid articles of food and drink being scrupulously avoided; the functions of the skin be properly maintained; and sexual intercourse be interdicted.

CHAPTER II.

STRICTURE OF THE URETHRA.

By the term stricture is understood a permanent diminution and loss of dilatability of the lumen of the urethra, through which there is a corresponding obstacle to the passage of the urine and the introduction of instruments.

The causes of stricture may be conveniently arranged under two heads, the traumatic and the pathological. Of these, the latter are by far the more common. Tumors and excrescences of the urethra, and a varicose state of the mucous membrane of this canal, cannot give rise to stricture, properly so termed, and should, therefore, be excluded from the list of exciting causes.

Violence inflicted upon the urethra, whether from without or within, may excite inflammation, and develop a stricture. A wound, penetrating the canal, may be attended with loss of substance, or fail to unite evenly, and so induce the disease. Some of the very worst and most unmanageable cases that I have ever seen were thus produced. The particular kind of injury is generally a blow, fall, or kick upon the perineum, eventuating in a laceration of the lining membrane, or of this membrane and the subjacent tissues. Sailors not infrequently suffer in this way, by being precipitated from the rigging of a vessel; and I have seen several instances in which the accident was produced by persons falling from a considerable height upon the round of a chair. A bad stricture occasionally results from violence inflicted by a catheter or bougie. The cicatrice left after lithotomy, especially when the operation has been followed by severe inflammation, and a calculus permanently lodged in the membranous portion of the urethra, have sometimes been succeeded by obstinate contraction.

Of the pathological causes of stricture, the most frequent, unquestionably, is gonorrhœa. Whenever this disease is obstinate and protracted, or the attacks are frequently repeated, it is almost certain to be followed by a considerable effusion of inflammatory

new material, and more or less contraction of the urethra. Judging from my own experience, I am convinced that at least ninety per cent. of all cases, not traumatic, are the effect of gonorrhœa. Urethritis from common causes, as frequent paroxysms of spasm of the canal, lithiasis, strong injections, non-specific female discharges, excessive or prolonged sexual intercourse, and masturbation, are also capable of producing the affection.

Finally, stricture is occasionally produced by the cicatrization of chancres. Of this I have witnessed several very obstinate cases. The obstruction, when thus induced, is generally situated at the anterior extremity of the urethra, just behind the external orifice.

The more simple form of the affection depends upon a hyperplastic condition of the parenchyma or connective tissue of the mucous membrane, which, in the early stages, is swollen and œdematous from the accumulation of young cells and albuminous fluid, at the same time that the surface is covered with minute granulations, which pour out a gleety discharge. As the inflammation becomes more chronic, the fluid exudation is absorbed, the cells are converted into contractile fibrous tissue, and the granulations disappear. As a natural sequence, the mucous membrane loses its pinkish color, and is converted into a non-vascular, pale, or grayish, thickened band of cicatricial tissue. In a more advanced stage, the inflammatory new material infiltrates the submucous and muscular coats of the urethra, gluing them together, so that they are unable to expel the last drops of urine. In the worst class of cases, in addition to the foregoing structures, the erectile tissue and proper fibrous tunic of the urethra are invaded by the exudation, and converted into a thick, dense, inelastic mass, the tendency of which is to contract more and more the longer it remains unrelieved.

Stricture of the urethra occurs in both sexes, and at all periods of life. Men, however, are far more prone to it than women, and it is most common in young adults and middle-aged subjects. It is occasionally met with as a congenital vice at or near the external meatus. I have witnessed it as a result of gonorrhœa in a lad of sixteen, in whom the symptoms were of three years' duration, and I have also seen the traumatic form of the affection in a child of eight.

Stricture presents itself in various forms and degrees. Thus, it may be simple or complicated, common or traumatic, partial

or complete, soft or callous, dilatable or undilatable, non-sensitive or irritable, permeable or impermeable, recent or old. These terms are sufficiently significant, and do not, therefore, require any special explanation. Much diversity prevails in relation to its locality, number, shape, consistence, and extent.

No part of the urethra, except, perhaps, the prostatic, is entirely exempt from this affection. The results of my practice lead me to infer that it is most common, first, in that portion of the urethra which is comprised between the scrotum and the head of the penis; secondly, at the membranous part of the tube, or at the junction of this and the bulbous part, and, lastly, at the anterior extremity, within a few lines of the meatus. I have never seen a stricture in the prostatic portion of the canal, and, therefore, conclude that it must be exceedingly rare there, if indeed it ever exists. I have repeatedly met with it near the external meatus.

The seat of this disease has been very carefully examined by Sir Henry Thompson,¹ who has availed himself of the advantages afforded by the various public collections in London, Edinburgh, and Paris. The number of specimens inspected was 270, embracing 320 distinct strictures. Of these 215, or 67 per cent. of the entire number, were situated at the subpubic curvature and its vicinity, or the junction of the membranous and spongy portions, and one inch of the canal before, and three-quarters of an inch behind the triangular ligament; 51, or 16 per cent., in the centre of the spongy portion; and 54, or 17 per cent., at the external orifice, and within two inches and a half of that point. Sir Henry found that the affection was most frequent in the bulbous part of the spongy portion, and least frequent of all at the posterior part of the membranous portion. In 226 cases, the stricture was single, and in 185 of these it occupied the posterior region, in 17 the middle region, and in 24 the anterior region. In 8 cases, the canal was obstructed in all these regions, in 10 in the first and second only, in 10 in the first and third only, and in 13 in the second and third only.²

¹ Pathology and Treatment of Stricture of the Urethra, 2d ed., p. 83. London, 1858.

² It would be exceedingly difficult, if not impossible, judging merely from measurements made on wet specimens, to determine the most common locality of stricture, since the urethra of the living subject is at least one inch shorter

Strictures vary much as to their number. In a majority of the cases that have fallen under my observation, there was not more than one; frequently, however, I have seen two, and occasionally I have met with three and even four. The latter number is rare; but it is sometimes exceeded. Thus, John Hunter saw an instance of six; Lallemand, of seven; Colot, of eight; Leroy, of eleven; and Otis, of fourteen. When the strictures are multiple, they may be in close proximity with each other, or separated by a considerable interval. Ducamp states that when there are several coarctations, the most extensive one will be found at the curve of the urethra, and the others between that point and the head of the penis. My practice has not furnished me with any such coincidence.¹

than when it is removed from the body and stretched out for inspection. With a view to throw some light on this point, the editor has made careful examinations, with the exploratory bulbous bougie, which is the only instrument that can be relied upon for this purpose, of all the cases that have come under his personal care within the past twenty-two months. Of 178 strictures, occurring in 100 living subjects, 76, or 43.93 per cent., were found in the posterior region above described; 48, or 27.74 per cent., in the middle region; and 49, or 28.32 per cent., in the anterior region. The percentage of coarctations in the curved portion of the urethra was, therefore, less, and in the straight portion of the canal, greater than that obtained by Sir Henry Thompson from his examinations of morbid specimens. 47 were examples of one stricture only; 34 of two; 15 of three; 8 of four; and 1 of five strictures.

Strikingly different results were derived by Professor Otis* from the measurements of 258 strictures in 100 living subjects. The disease was seated in the posterior region in only 14, or 5 per cent.; in the middle region, in 81, or 31 per cent.; while in 163, or 63 per cent., it was located in the anterior region. Hence, the combined investigations of Dr. Otis and the editor, which comprise 431 strictures, occurring in 200 cases, demonstrate that, during life, 20.88 per cent. of strictures are found in the region of the subpubic curvature; 29.93 per cent. in the centre of the spongy portion; and 49.18 per cent. in the anterior two inches and a half of the canal.

¹ Of the 100 cases recorded by the editor in the preceding note, 47, or less than one-half, were examples of solitary stricture. A point of great practical importance in connection with the subject of the multiplicity of strictures, and one to which he desires to call special attention, relates to coarctations seated within the anterior inch of the urethra, or what may be termed its glandular portion. When this region is affected it may be accepted, as a rule, that one or more strictures will be detected farther back. Thus, he found 86 strictures in the glandular portion, and, of these, only 3, or 8.33 per cent., were single; while in 19 it was double; in 11 triple; in 2 quadruple; and in 1 quintuple.

* On Stricture of the Male Urethra, its Radical Cure. Pamphlet, New York, 1875.

Stricture is met with under several varieties of form. One of the most common is the linear, in which the urethra exhibits the appearance of being constricted by a thread. When it embraces the entire circumference of the canal, it forms a diaphragm, or septum, perforated at its periphery, or at its centre, as in fig. 125, from

Fig. 125.



Linear Stricture.

Fig. 126.



Bridle Stricture.

Holmes. When, on the other hand, the coarctation is only partial, it assumes the appearance of a crescentic fold on one side of the canal. In rare instances, a small, narrow band is stretched across the passage, constituting the bridle stricture, of which fig. 126, from Holmes, affords a good illustration. These isolated bands are probably nothing more than short false passages.

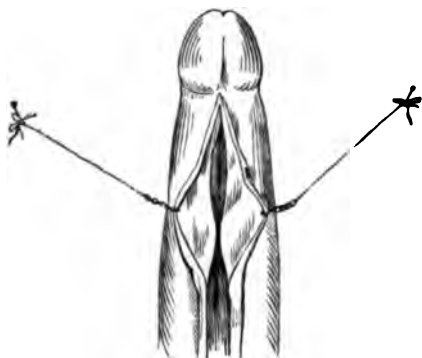
The annular stricture, fig. 127, from one of my preparations, is usually from one-fourth to one-third of an inch in extent, and involves the tissues to a greater depth than the preceding form. In a remarkable instance which I witnessed many years ago, nearly the entire length of the canal from one extremity to the other was involved.

The indurated annular stricture is characterized, as the term implies, by great hardening, the new tissue substituting nearly all, if not all, of the tunics of the urethra. The contraction is greatest at the centre, the whole presenting an hour-glass appearance, as in fig. 128, from a private specimen.

The average distance of the most posterior stricture from the external meatus was five inches and five-eighths. That the affection was not due to spasmodic contraction of the muscular fibres of the urethra from irritation reflected back from the anterior stricture, was shown by the fact that it persisted after the free division of the latter, and imparted the sensation of a well-defined band or ring, over which the exploratory bougie abruptly jumped, so to speak, on its withdrawal.

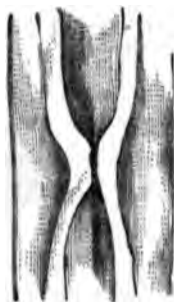
Finally, a stricture may be tortuous, and deviate more or less from the axis of the canal. It may be indurated or not, and is liable to present serious difficulty in the passage of instruments.

Fig. 127.



Annular Stricture.

Fig. 128.



Indurated Annular Stricture.

The degree of contraction ranges between the slightest diminution of the natural size to almost complete obliteration. When the disease has reached this point, the urine is discharged in drops, and the bladder is never entirely empty. Few strictures, however firm and narrow, can be said to be impermeable, in the true acceptance of the term. As long as a stricture admits of the discharge of urine, it cannot be considered as impermeable, although, from its tortuous course, its multiplicity, or the hard, callous condition of the surrounding tissues, through which the natural relations of the canal are materially changed, it may be impassable by the bougie, sound, or catheter, in the most skilled hands. Hence, I assert, upon the testimony of personal experience, that there is a class of strictures, the result of ordinary causes, which, while they admit of the passage of urine, slowly and imperfectly it may be, do not permit the introduction of any instrument, however small, into the bladder.

Strictures which are impermeable to urine are very uncommon; nevertheless they occasionally occur, and I have met with them both in the male and female, although only once in the latter. In the male I have seen at least four cases, which I can now recall to my mind, of this form of coarctation. The last was that of a young gentleman, aged twenty-four, who, in consequence of an obstruction thus produced, became the subject of stone in the

bladder, which I removed by the lateral section. Two fistulous apertures existed just in front of the scrotum, through which every drop of urine was evacuated. The stricture was of a firm, dense, fibrous consistence, and of a whitish appearance, offering great resistance to the knife, and completely obliterating the urethra.

The contracted part may be soft and elastic, or hard and firm, according to the duration of the disease, and the degree of transformation of the inflammatory new material, upon the presence of which the obstacle depends. Recent strictures are generally soft and yielding, on which account they are frequently described as dilatable strictures; old strictures, on the contrary, are usually callous, tight, and resisting. Exceptions to this rule are, of course, not uncommon. Thus, I have known a stricture acquire such a degree of firmness, in a few months, as to render it impossible to pass even the smallest sized bougie. On the contrary, I have occasionally met with an ancient stricture which readily and permanently yielded to the process of dilatation in a very few days. It is worthy of remark that the consistence of a stricture, especially if it be large, is seldom uniform, but that it varies in different parts of its extent, being, perhaps, quite soft at one point, hard at another, and almost cartilaginous at a third.

The symptoms of stricture, considered generally, are a discharge of thin, gleety matter from the urethra; diminution of the stream of urine, which is usually spiral, forked, flattened, or dribbling; frequent, slow, and difficult micturition, often preceded, accompanied, or followed by a sense of scalding; loss of power of expelling the last drops of urine; uneasiness about the loins, perineum, and anus; pain in coition; nocturnal emissions; elongation and thickening of the penis; and hardness at the seat of the obstruction, detectable by the finger. During the progress of the disease, the patient is liable to be troubled with swelling of the testicle, chordee, hemorrhoids, hernia, and retention or incontinence of urine. The general health is variously affected; sometimes slightly, at other times severely. In the more aggravated forms of the malady, there is almost always derangement of the digestive organs; the system is more or less irritable; and the slightest exposure, fatigue, intemperance, or

irregularity in eating, is apt to be followed by an exacerbation of the local suffering.

One of the first circumstances which generally attracts the attention of the patient, is a gleety discharge from the urethra. This symptom is of frequent occurrence, and is, in fact, sometimes the only one present; still it is not characteristic. The fluid, which is mucous, or muco-purulent, is more or less opaque, thin, and viscid, and varies in quantity from a few drops to half a drachm or more in the twenty-four hours. It is usually most abundant in the morning, before micturition; stains the patient's linen, and agglutinates the lips of the orifice of the urethra. The discharge has sometimes a thready appearance, like vermicelli; and not infrequently it occurs in the form of little flakes, of a whitish or yellow color, similar to particles of soft-boiled rice. The secretion, in whatever aspect it exhibits itself, proceeds from the mucous membrane of the urethra, which, in most cases of stricture, is in a state of inflammation, both behind and in front of the site of the obstruction. It is sometimes absent for days together, and then, in consequence of increased local irritation, returns as copiously as ever. Trifling as this symptom apparently is, it always proves a source of great annoyance to the patient, who looks for it fifty times a day, and is sure, when he finds it, to post off to consult his physician about it.

Another early symptom is a slight diminution of the stream of urine, accompanied by a sense of scalding or pricking in the urethra, a feeling of weight at the neck of the bladder, and an increased frequency of micturition. The patient is, perhaps, obliged to use the chamber several times during the night; and, if he is exposed to cold, takes much exercise, or indulges a little more than usual in the pleasures of the table, he finds that he is unable to retain his water as well as formerly, or that it passes only drop by drop, and with considerable pain and spasm. By and by, the local symptoms assume a more decisive character. The stream of urine is much smaller than it was at first, and has a wiry, twisted, spiral, or corkscrew shape: sometimes it is double, forked, or bifurcated. Its force is also sensibly lessened; instead of being projected in an arched form, as it is in the natural state, to a distance of several feet, it falls perpendicularly between the patient's legs, or upon his trowsers, although he is conscious that the bladder at the time is making unusual efforts to expel its

contents. In the worst forms of the disease, the urine is discharged in drops, or it dribbles away from the penis, and flows noiselessly into the receiver. This mode of micturition may be constant or intermittent, and is often, from the most trifling cause, followed by complete retention.

A prominent symptom of stricture is frequent, slow, and difficult micturition. In the healthy state, the moment the bladder contracts, its contents begin to flow, nor do they cease until they are completely evacuated. In stricture, on the contrary, great difficulty is often experienced in starting the urine, and an unusual length of time is required to effect its discharge, accompanied by much straining, and pulling of the penis. In fact, the affected part is obliged to undergo a sort of preliminary dilatation, which, as well as the subsequent steps of the process, demands the full play and coöperation of the diaphragm and the abdominal muscles. Straining, sometimes violent and long continued, is seldom entirely absent in this disease. To promote the flow of urine, the patient throws his body forwards, and squeezes with all his might, as if he were about to force out both the bladder and bowels.

In nearly all cases there is morbid sensibility of the urethra, or of the urethra and the neck of the bladder. The affection is evidently seated in the mucous lining of the part, and often constitutes a source of real suffering. Considerable diversity obtains in regard to the nature and amount of this morbid sensibility. Most commonly it is a scalding or burning; but sometimes it is merely a feeling of soreness, uneasiness, or tickling. It may be circumscribed or diffused; slight or severe; intermittent or persistent. The most trifling circumstance, such as an acrid state of the urine, an attack of rheumatism, exposure to cold, or the use of stimulating food or drink, is liable to increase it.

Patients affected with stricture suffer much with pain and tenderness in the perineum, anus, and penis. Very frequently, the irritation, which is always purely reflex, extends to the groin, the inner side of the thighs, the sacrolumbar region, the gland of the penis, and the testes, the latter of which are occasionally so exquisitely sensitive as to be unable to bear the slightest pressure, or even the touch of the finger. The bladder also is often the seat of considerable pain, of a scalding or burning character, and chiefly referable to the neck of the organ,

although sometimes it is diffused over the entire viscus, and is much increased by pressure upon the hypogastrium, rough exercise, sexual intercourse, and other causes. A most distressing symptom, occasionally witnessed in this complaint, is a constant irritation in the superior part of the rectum. It is most apt to manifest itself when the disease extends its ravages to the prostate gland and the connective tissue between the bladder and the bowel.

The subjects of stricture, especially that variety which is attended with hyperæsthesia of the urethra and neck of the bladder, are very prone to suffer from despondency, nervousness, and sexual hypochondriasis, in consequence of imperfect erections, premature ejaculation, and nocturnal emissions, which generally take place under the influence of a lascivious dream, and are almost always accompanied by considerable pain. The semen, at such times, as well as in the act of coition, instead of being ejaculated, passes backwards into the bladder, or is retained in the urethra, behind the obstruction, from which it afterwards oozes out by degrees, or is discharged, along with the urine, in a state of solution. It is for this reason that a man, affected with a tight, callous stricture, is sometimes impotent; for, although he may be able to copulate, he cannot procreate, because none of the secretion reaches its destination, except, perhaps, when the act is unduly protracted.

The penis, in stricture, undergoes a sort of hypertrophy; it is longer and thicker than usual, more or less deformed, and deprived, at least in some degree, of its natural sensibility. The prepuce, which generally participates in the enlargement, is sometimes so much infiltrated with serum as to require to be punctured, in order to prevent gangrene. These appearances are caused by the constant pressure and pulling which the patient is obliged to exert to facilitate the process of micturition.

There is often a good deal of hardness of the urethra, not in its entire extent, but at some particular point. The parts most commonly implicated, according to my observation, are the bulbous and membranous, where the deposit of lymph, the immediate cause of this symptom, is sometimes so considerable as to compress the canal, or throw it out of its natural course, thus greatly increasing the difficulty of introducing a catheter or

bougie. The induration, which is always produced by an extension of the inflammation of the mucous membrane of the urethra to the subjacent tissues, is generally easily detected by the application of the finger, and should not be confounded with that which is caused by the stricture itself.

Chordee is frequently a troublesome symptom in this disease. Although most common at night, it sometimes comes on in the day, and always proves a source of much annoyance, if not of actual suffering. When the cells of the spongy structure of the urethra are distended with lymph, the penis in erection may be drawn downwards, upwards, or laterally, according to the situation of the effusion, upon the presence of which the incurvation depends.

Another symptom, which is occasionally noticed in this affection, is hematuria, or a discharge of blood from the urethra. The hemorrhage is usually slight, and seems to be most common in old, callous strictures, attended with dilatation of the canal, and varicosity of the lining membrane. The occurrence is most frequent during erections, and probably always depends upon a laceration of some of the larger vessels of the affected part, which are unduly stretched when the penis is in this condition. A considerable hemorrhage is also sometimes excited during the passage of a bougie or catheter, no matter how gently this may be effected.

During the progress of the disease, the patient, in consequence of the constant straining to which he is subjected whenever he attempts to void his urine, is liable to suffer from hemorrhoids, prolapse of the bowel, and even hernia. These complications, which are sufficiently common, especially in elderly persons, greatly increase the local distress, and assist materially in undermining the general health.

The urine is variously altered in stricture, according to the degree of irritation of the urinary bladder, the prostate gland, the ureters, and the kidneys. When these organs participate in the mischief, as they are apt to do, sooner or later, they throw off an unusual amount of mucus, which, mingling with the urine, imparts to it a remarkably viscid, ropy character, changes its color, and induces new chemical changes. The fluid, which is generally loaded with saline matter, is speedily decomposed

on exposure to the atmosphere, and, in fact, often even in the bladder, emits an ammoniacal odor, and is of a whitish, lactescent, dark, or blackish tint.

Finally, as two other effects of stricture, I may mention here retention and incontinence of urine. As these affections, however, have been already fully described, I will merely add that the first is the most common in the milder forms of the malady, and the last in the more severe. It should not, however, be forgotten that the constant dribbling, witnessed under such circumstances, is usually an evidence of retention rather than of incontinence; the distinction is of great practical consequence, and a correct diagnosis is therefore of paramount importance. When the urine passes off incessantly, the attendant may rest assured that, as a general rule, the bladder is never entirely empty, but that a certain quantity of water remains in its more dependent portion, where it soon becomes a source of irritation and suffering.

Although the symptoms which have now been considered are, in general, sufficiently denotive of the real nature of the disease which produces them, they can, nevertheless, not be regarded as pathognomonic. They may be the result of other causes, and are, therefore, rather of negative than positive value. To establish, in an unequivocal manner, the diagnosis in any given case, it is indispensably necessary to explore the urethra with some instrument. The one which I usually select for this purpose, is a common silver catheter, large enough to fill, without distending, the meatus, and rounded at the extremity, which is passed down the tube, first to the obstruction, then into it, and lastly, if possible, beyond it. If the instrument does not engage in the opening, smaller ones are to be successively resorted to, until the contraction is entered and slightly grasps the catheter. In this way the calibre and locality of the stricture, and its nature, as to sensitiveness or irritability, may be determined. A far better and more accurate means of exploration, and the only one which conveys any reliable idea of the extent and multiplicity of strictures, is the soft exploratory bulbous bougie, of Leroy, delineated in fig. 129. The stem, which is several sizes smaller than the acorn-shaped bulb, permits it, if there be more than one stricture, to move freely in the first, which cannot happen with the ordinary catheter. On its withdrawal, the abrupt shoulder

comes in contact with the posterior face of the coarctation, and imparts to the touch a sensation as if it had jumped over an obstructing band. To estimate the extent of a stricture, a number which corresponds in size with that of the external meatus, is carried on until it meets with an obstruction, when a mark is made upon the stem with the thumb-nail on a level with the meatus. Should the bulb be too large to pass through the stricture, smaller ones are employed until the object is effected, and a second mark made when it meets with resistance during its withdrawal. The distance between the two marks indicates the length of the stricture.

Fig. 129.



Exploratory
Bulbous
Bougie.

All examinations of this kind should be conducted with the utmost gentleness and deliberation, lest spasm and pain be excited. By slow and cautious manipulations, the point of an instrument may often be insinuated into the tightest stricture, or into one so tender and irritable as to resent every attempt of an opposite description.

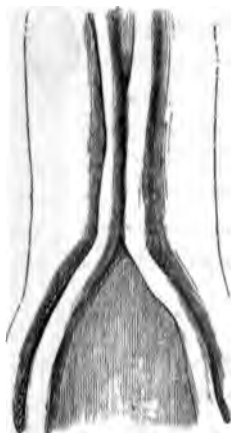
When the spongy portion of the urethra is affected, a tolerably correct idea of the nature, seat, and extent of a stricture may sometimes be acquired by the application of the thumb and finger, along the under surface of the penis.

Stricture seldom exists long without giving rise to disease in the adjoining and associated parts. The organs, which, besides the urethra, are more liable to suffer are the prostate gland, the bladder, the ureters, and the kidneys. The testes, penis, seminal vesicles, perineum, and rectum, also not unfrequently participate in the evils consequent upon the malady. The affections which thus spring up during the progress of the mechanical obstacle of the urethra, are often of a most serious character, and add greatly to the distress and danger of the case.

One of the most frequent, as well as the most serious, lesions consequent upon stricture, is a dilatation of the urethra behind the seat of the obstruction, fig. 130, from one of my preparations. This is evidently owing to the manner in which the urine is impelled against the stricture whenever an attempt is made to

evacuate it; and varies in degree from the slightest increase of the natural calibre of the canal to that of a pouch capable of

Fig. 180.



Dilatation of the Urethra
behind the Stricture.

holding an almond, a pullet's egg, or even a mock orange. In the more aggravated forms of the affection, the abnormal reservoir presents the appearance, and subserves the purpose, of an accessory bladder, which is habitually distended with urine. The parietes of the dilated part are generally attenuated, and, therefore, liable to give way under the pressure of its contents. The enlargement is most common at the membranous and prostatic portions of the urethra, but may take place at any point of its extent. Sometimes it involves nearly the whole length of the canal, and is so great as to admit a middle-sized finger.

The urethra in front of the obstruction is either normal, diminished, or dilated.

The latter occurrence, of which Sir Charles Bell has related and figured a most extraordinary example, is exceedingly rare, and cannot be satisfactorily accounted for upon any known pathological principles. In cases of long standing, and especially in those which are accompanied by fistule of the perineum, allowing most of the urine to escape in that direction, this portion of the canal is sometimes considerably diminished, but seldom entirely obliterated. In the milder forms of the malady, the passage in front of the stricture is generally natural.

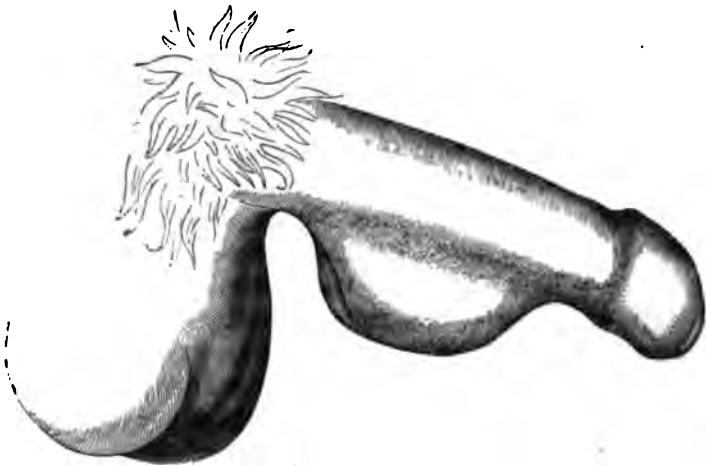
There are few cases of organic stricture in which there is not more or less inflammation of the mucous membrane at, and for some distance beyond, the seat of the obstruction. The greatest amount usually exists behind the stricture, but there is not infrequently a good deal within it, as well as in front of it. The disease is indicated by increased vascularity, and sometimes, also, by a deposition of lymph.

Another consequence of stricture is the development of fistule in the perineum, caused by ulceration or rupture of the inflamed mucous membrane behind the seat of the obstruction, and the escape of a small quantity of urine into the subjacent tissues; or by the existence of irritation exterior to the canal, and its

gradual extension to its interior. In either case, an abscess, or, what is worse, a slough, is formed, followed by a fistule, through which more or less of the urine continues to be discharged until the stricture upon which it depends is removed.

In a patient, aged twenty-two, whom I attended for stricture of the urethra in the autumn of 1851, a remarkable tumor existed on the under surface of the penis, giving this organ a most singular and grotesque appearance, sketched in fig. 131.

Fig. 131.



Urinary Cyst consequent upon Stricture of the Urethra.

Of a semiovoidal shape, it was of solid but elastic consistence, and was six inches and a half in circumference, by three inches and a half in length. It had been first noticed about three months previously, from which time it had gradually increased until it had acquired its present bulk. It was entirely free from pain, but had disqualified the young man for sexual intercourse, and was a source of great disquietude to him on account of the obscurity of its character. On cutting into it, it was found to contain an ounce of clear, limpid fluid, and to be nothing but a urinary cyst, the inner surface of which was perfectly smooth and glossy. At the inferior part of the tumor, near its centre, was a small fistulous opening, giving vent frequently to a little urine, and always, when the part was compressed, to a small quantity of mucopurulent fluid. The urethra contained two very tight strictures, of two years' standing, and the pro-

duct of a violent attack of gonorrhœa; one was situated just behind the external orifice, and was so small as hardly to admit a stout bristle; the other was three inches farther back, and also very firm and callous. It was over the last stricture that the cyst here described was situated; it was entirely on the outside of the canal, and had evidently been caused by a rupture of the mucous membrane, followed by the escape of urine, and the gradual expansion of the surrounding connective tissue. The skin was entirely free from discoloration, but was a good deal thickened by interstitial deposits.

An instance of a somewhat similar character, dependent, however, upon external injury, and a want of parallelism between the ruptured ends of the urethra, occurred to my friend Dr. Washington L. Atlee, and is related in the *American Journal of the Medical Sciences* for October, 1849.

Another effect, and that by no means an infrequent one, especially in tight and old stricture, is dilatation of the openings of the mucous follicles of the urethra, particularly at the site of the affection, and of the orifices of the ducts of the prostate, which sometimes become so much enlarged as readily to intercept the beak of a bougie or catheter. This result is well shown in fig. 132, from Thompson, the peculiar retiform appearance being due to the interlacement of the septa which intervene between the enlarged orifices of the ducts of the prostate.



Section of Urethra, showing very narrow Stricture, and dilated and reticulated Membranous and Prostatic Portions behind it.

It was formerly supposed that enlargement of the prostate was a very common effect of organic stricture of the urethra. Recent and more accurate observation, however, has fully disproved the truth of this opinion, and shown that when these two affections coexist, the

circumstance is generally to be regarded as purely accidental. Although enlargement is infrequent, this gland unfortunately often suffers in other respects. The most common lesion, in tight, callous, and protracted stricture, is inflammation of the substance of the organ, eventuating occasionally in suppuration, the development of an abscess, the formation of calculous concretions, complete atrophy, or the degeneration of the gland into a membranous pouch. From extension of the irritation, an abscess sometimes forms between the bladder and the rectum, causing excessive suffering, and ultimately, perhaps, a fistulous communication.

The bladder, in confirmed cases, soon becomes hypertrophied, and finally sacculated, while its capacity is either diminished or increased, generally the former. So common, indeed, is this coincidence, that it must always be viewed in the light of cause and effect. The lining membrane is in a constant state of inflammation, attended with an inordinate deposit of mucous, and even mucopurulent, fluid. Another occurrence, worthy of passing notice, is the proneness, in patients affected with this malady, to the development of urinary calculi. This subject, like that of hypertrophy of the bladder, has been already fully discussed in its appropriate place.

The ureters frequently participate in the disorders which arise in the progress of organic stricture. The most common lesion is inflammation of their lining membrane, with suppuration and deposits of lymph, and irregular dilatation of their calibre. Their parietes are sometimes considerably thickened, or thickened at some points and attenuated at others; and occasionally they exhibit a strictured, nodose, or puckered appearance. Cases occur in which one of these tubes is sometimes very much contracted, or nearly obliterated.

The kidneys are variously affected in this disease. Inflammation frequently occurs at an early period, and gradually progresses until it ends in serious mischief, if not in total ruin of the affected organ. The malady seldom exists in the same degree in both viscera. Sometimes one is entirely healthy, or nearly so, while the other is converted into a large abscess, filled with serous cysts, inflamed, hypertrophied, granulated, or changed into a membranous pouch, devoid of renal tissue.

The adjoining sketch, fig. 133, strikingly illustrates the effects of stricture of the urethra upon the rest of the urinary organs. The prostate gland is completely destroyed, the mucous mem-

Fig. 133.



Effects of Stricture on the Urinary Organs.

brane of the bladder is removed by ulceration, the ureter is immensely enlarged, and the kidney is converted into a mere shell, which was filled at the time of the dissection with purulent matter. The drawing is from a specimen in the pathological collection of the New York Hospital.

The testes are prone to suffer in stricture, apparently from continuous sympathy, or, more properly speaking, from direct irritation. In many cases they become morbidly sensitive; and it is not uncommon for one or both to be swollen and indurated. The irritation occasionally extends to the vaginal tunic, and produces hydrocele. The spermatic cords are sometimes remarkably tender, or enlarged and unnaturally hard.

The seminal vesicles are also liable to suffer; their lining membrane becomes inflamed, and, in cases of long standing, their volume is occasionally remarkably diminished, at the same time that their coats are very firm, dense, and contracted.

One of the most singular occurrences in old and severe strictures of the urethra is an inordinate development of the penis. The whole organ is not only elongated but remarkably thick, hard, and rigid; a circumstance which appears to be owing, not so much to the irritation of the neck of the bladder, which often exists in a high degree in this disease, as to the milking efforts, if I may so express myself, which the patient is constantly obliged to make in order to promote the flow of urine through

the obstructed urethra. For the same reason, the prepuce is often remarkably swollen and œdematous.

Finally, a stricture of the urethra occasionally makes a very injurious impression upon the nervous system, due, apparently, to reflex irritation. Thus, in a case recorded by Sir Benjamin Brodie, the disease induced lameness and pain in the foot, which were promptly relieved by the use of the bougie.

The prognosis of stricture is variable. If taken in hand before it has become hard and firm, or while it is still recent, and before it has given rise to any serious lesion of the urinary apparatus, it is, in general, neither dangerous, nor difficult of cure. It is, in fact, under such circumstances, rather an inconvenience than a disease. When, however, it has made considerable progress, offers much resistance to the passage of the urine, and has excited inflammation in the neighboring organs, it may be considered as a very serious affection, liable, if permitted to proceed, to be followed by the worst consequences, as may be gathered from the account which has just been given of its pathological effects. As a general rule, it may be stated that a recent stricture is much more easy of cure than an old one; a small than a large one; a soft than a callous one; an inflammatory than a traumatic one. Furthermore, a stricture of the membranous portion of the urethra is usually harder to manage than one of the spongy, chiefly because the former, in consequence of its depth and the parts by which it is embraced, is less under our control than the latter, which is comparatively accessible. An obstruction in this situation is also more liable, as a general principle, to awaken serious disease of the prostate gland, the urinary bladder, the ureters, and the kidneys.

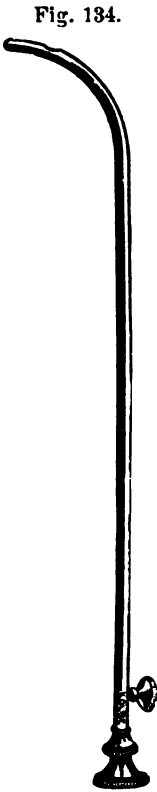
When a stricture is old and callous it is not only irradicable, but it may gradually so far undermine the general health as to cause death; or life may be assailed by the supervention of retention of urine, or by the extravasation of this fluid into the perineum or scrotum, in consequence of a laceration of the urethra, or by rupture of the bladder. The immediate cause of death is sometimes a small calculus plugging up the canal behind the stricture, thereby preventing the discharge of the urine. When the health is much impaired from protracted vesical or renal complications, the brain sometimes sympathizes in the

general disorder; a slow subacute inflammation, attended by coma, is set up in this organ and in the arachnoid membrane; and the patient at length dies from serous effusion.

Various methods are employed for effecting the permanent cure of stricture. Of these the most important, and consequently the most worthy of notice, are dilatation, rupture, incision, and external division, each of which has been more or less modified, according to the wants, whims, or caprices of different practitioners. It must be obvious, at a glance, that these methods, so opposite in their character and design, are not equally adapted

to all forms of the disease which they are intended to remedy. Hence, also, it will be perceived that there is a necessity, not only for describing these procedures, considered as so many distinct operations, but also for pointing out the cases to which each in particular is applicable.

Before resorting to any of these expedients, it is of paramount importance, I conceive, to attend to the general health, and to subdue local inflammation, tenderness, and spasm. Unless this be done, the practitioner will be much more likely to do harm than good. To effect this object, the patient should be kept in the recumbent posture for six or eight days previous to the intended operation; the bowels should be freely moved every forty-eight hours with some mild purgative; the secretions should be duly regulated; the diet should be light and unirritant; and recourse should be had occasionally to the warm bath. If there be any inflammation, irritation, or spasm of the urethra and the bladder, leeches must be applied to the perineum, followed by fomentations and anodyne enemata. Demulcent drinks should also be used; and there are few cases which will not be benefited by the exhibition of bicarbonate of soda and balsam of copaiba.



Porte-Cautique.

When the urethra is irritable, particularly if the case is to be subjected to rupture or incision, the excessive sensitiveness must be subdued by the methodical introduction of a conical

steel bougie and stimulating injections. Great benefit may be derived, especially if the part be studded with granulations, from cauterization with nitrate of silver. The operation is performed with the *porte-caustique*, represented in fig. 134, an instrument which I devised many years ago, and which is far superior, in point of safety, to that of *Lallemand*, still so much used in this country. It is shaped like a catheter, and is closed at its vesical extremity, near which, on its convexity, there is an elongated aperture, through which, by means of a cup attached to the stylet, filled with extract of *hyoscyamus* and powdered nitrate of silver, the caustic is brought fairly in contact with the affected surface by a rotary movement of the instrument. The operation usually causes some pain and scalding, and is followed by an increase of the discharge; but these symptoms disappear in four or five days.

Too much stress cannot be placed upon this preliminary treatment; indeed, I should consider it highly culpable to neglect it under any circumstances. When the way has been thus paved, the particular kind of treatment is to be determined by a careful consideration of the nature of the obstruction. There are few points in surgery which require more judgment and experience than this.

Some practitioners are in the habit, in their attempts to cure organic stricture, of relying mainly upon constitutional means, especially rigid abstinence, carried almost to starvation, and the daily use of nauseating doses of tartarized antimony, or the frequent exhibition of emetics; conjoined with rest in the recumbent posture, and the avoidance of all sources of bodily excitement. That such a mode of treatment is well calculated to allay vascular action, and promote the absorption of the effused lymph which gives rise to the obstruction, may be readily imagined; but any advantages thus accruing are generally more than counterbalanced by the hardships which attend it. In the callous form of the disease, such a proceeding must be perfectly futile; for there are few cases which can receive any permanent benefit from it, and in which it will not be more likely to wear out the patient than his stricture. Of a considerable number of persons whom I have known to be treated upon this principle, I do not recollect a single one who experienced any decisive or

permanent relief, or who was willing again to submit to its exorbitant, unscientific, and injurious exactions.

The object, in any mode of treatment, being the restoration of the normal calibre of the urethra, it naturally follows that

Fig. 135.



Dr. Otis's Urethrometer.

no measure will be successful unless the size of the canal be previously ascertained in each individual case, and the contracted part be brought up to that standard. Hence, a careful exploration should always be made with the urethrometer, devised by Dr. Otis, and represented in fig. 135. Being well oiled and passed in its closed state, by means of the screw at the handle, the bulb is expanded to the point of filling the urethra comfortably, without, however, interfering with its being moved easily and painlessly backwards and forwards, when the index on the dial shows the normal circumference of the canal in millimetres, which is the standard of measurement in the French catheter scale. It should be remembered that a millimetre is equal to $\frac{1}{25}$ of an inch. In the absence of this instrument, the size of the urethra may be determined quite accurately by taking the circumference of the flaccid penis, between which and the calibre of the canal, a constant relation exists, as was first pointed out by Dr. Otis. Thus, a circumference of 3 inches indicates a calibre of 30 millimetres, or one inch and one-fifth, while each additional quarter of an inch in circumference represents an increase of two millimetres in the calibre of the urethra.¹

In estimating its normal size, it must not be forgotten that the urethra varies at different portions of its extent. Thus, it always presents two contractions, one at the external meatus and one at the bulbo-membranous junction, and two dilatations, which are seated respectively in the navicular fossa and in the sinus of the bulb. The meatus being the narrowest

¹ From a number of measurements made upon private and hospital cases, the editor is enabled to add additional confirmatory evidence of the correctness of the estimates of Dr. Otis.

portion, it is not the true index of the calibre of the canal beyond that point, and should not be used as a gauge for the passage of instruments, although a catheter which enters the orifice should pass readily into the bladder unless there be an obstruction. The widest and most dilatable portions of the urethra are at the bulb and the navicular fossa, the former being the larger by two millimetres and a half, or one-tenth of an inch, while the calibre of the spongy portion is intermediate between the two. Hence, if a stricture be seated in the bulb, and the urethrometer shows the spongy urethra in front of it to be equal, for example, to 25 of the French scale, the only rational practice will be to bring the calibre of the contracted part up to 30 millimetres, since, in its normal state, the circumference of the bulbous portion is greater by two millimetres and a half than that of the spongy portion, and the canal should be dilated, as can easily be done, to twice that extent, which represents its real size when it is ordinarily stretched. Again, if the navicular fossa measures 27 millimetres, and the stricture be situated in the spongy portion anterior to the bulb, the latter should be made to correspond to about 25 of the French scale, as the spongy portion is naturally not so capacious as the former locality. In other words, instead of taking any one point of the urethra as the standard for the whole, the normal relations of its individual portions must be preserved.

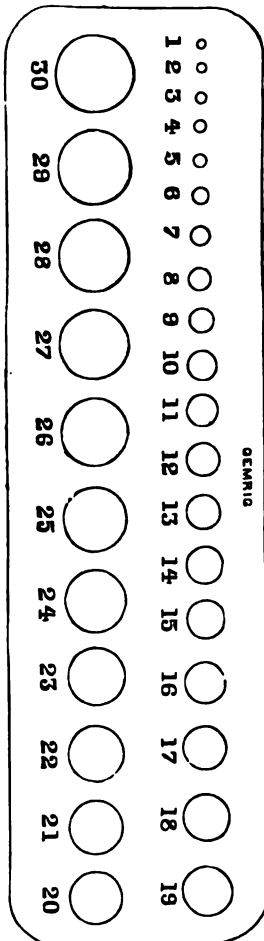
In all instances, the meatus should be enlarged if it interferes with the passage of an instrument of the size adapted to restoring the constricted part to its original dimensions, as indicated by the urethrometer.

1. Dilatation.—This process was applied to the cure of stricture at an early period of the profession, and was for a long time the only one in use. Notwithstanding the various attempts that have been made to supersede it, and the reproaches that have been cast upon it by modern writers, it still maintains its place in the estimation of enlightened practitioners, and there can be no doubt that it is frequently applicable to simple, soft, and recent strictures, while it is often demanded to prepare the way for other measures.

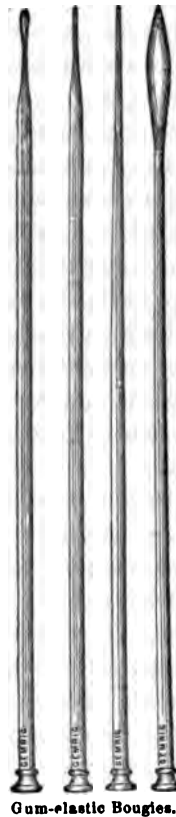
Dilatation may be performed either gradually or continuously, and for this purpose various instruments have been recommended,

those usually employed being the soft French elastic bougies, the silver catheter, and the nickel-plated steel bougie. Their sizes are graduated by a scale, of which by far the best, and, indeed, the only accurate one, is the French, represented in fig. 136. The numbers range from 1 to 30, and their increase in size is uniform, being one millimetre in circumference, No. 3 being equal to No. 1, and No. 30 equal to No 18, of the English gauge.

Fig. 136.



French Catheter Scale.

Fig. Fig. Fig. Fig.
137. 138. 139. 140.

Gum-elastic Bougies.

The soft bougies are especially serviceable in untrained hands for strictures below No. 15, of the French, or No. 9 of the English scale, and they are sometimes indispensable to overcome tortuous strictures. Those with conical extremities, figs. 138, 139, are useful in tight and narrow

cases ; but when the disease is of long standing and attended with enlargement of the openings of the mucous follicles and prostatic ducts, the addition of an olivary tip, as in fig. 137, prevents their becoming entangled in these pouches. The belliced bougie, fig. 140, is used to dilate the stricture alone, as the stem, from its greater narrowness, does not act upon the remainder of the canal and subject it to unpleasant distention.

My conviction, founded upon ample experience, is that the best and least irritating instrument for dilating a stricture is the nickel-plated steel bougie, fig. 144, with a short curve, provided with a heavy handle, and terminating in a somewhat conical point. Its great advantages are its smoothness and its weight, which facilitate its onward passage without the risk of making a false route. If the surgeon will only have confidence in this instrument, and allow it to remain in contact with the face of a stricture until the spasm provoked by its presence is overcome, he will rarely have to resort to soft instruments or temporize with those of small size.

a. In gradual or temporary dilatation the object is to proceed as cautiously as possible, so as to avoid all risk of irritation, commencing with an instrument that will readily pass the obstruction, and using afterwards a series of steadily increasing sizes until the treatment is perfected. The introduction is repeated every second or third day, commencing at each sitting with the one last used, and following it with a size larger, until the normal calibre of the urethra is attained. At first, the bougie should be conveyed into the bladder, and be immediately withdrawn ; but as the canal becomes more tolerant of its presence, it should be retained for five minutes.

In the management of very tight, or tortuous strictures, and strictures complicated by great induration of the perineum, it is sometimes impossible to overcome the obstacle with the ordinary instruments, when the olivary whalebone filiform bougies, fig. 141, will prove invaluable. Those with spiral points, or bent at an angle near their extremities, are especially serviceable when the opening of the obstruction is eccentric. Their passage is facilitated by previously injecting the urethra with oil, and imparting to them a rotary movement, especially if the patient be anaesthetized.

Fig. 141.

Filiform
Bougies.

A false passage, the usual seat of which is the floor of the urethra, complicating a stricture, is best avoided by the angular instrument of Mercier, represented in fig. 16, which is the only contrivance by which the roof of the canal can be closely hugged. When the opening is situated in the upper surface of the urethra, it may be avoided by the olivary bougie, represented in fig. 137. In the event of the failure of these instruments, another resource, and one that is often attended with success, is packing the urethra with filiform whalebone bougies, which engage in the false passage, until one slips on through the stricture into the bladder.

Finally, the plan of Mercier may be resorted to. This consists in introducing a metallic catheter, which is solid up to the dotted line, as represented in fig. 142, into the false passage, and then protruding,

Fig. 142.



Mercier's Catheter for avoiding a False Passage.

at the eye on its concavity, an elastic instrument, which may be guided into the true route, when the metallic catheter is withdrawn.

The treatment by gradual dilatation is, in the end, very unsatisfactory, relapses being the rule, and complete cures the exception. Its success is based upon the action of the absorbent vessels, stimulated by the contact of the instrument to the removal of the new tissue, upon the presence of which the obstruction depends. It is, therefore, only applicable to very recent cases, for when the disease is confirmed, it never induces entire absorption and disappearance of the cicatricial new formation. Hence, dilatation, if positively and methodically persisted in, is useful as a palliative measure, as it will prevent the occurrence of serious

secondary lesions, and render the patient comparatively comfortable during the remainder of his life. It is inapplicable to strictures at or near the meatus, and to impassable, very sensitive, resilient, traumatic, and complicated coarctations.

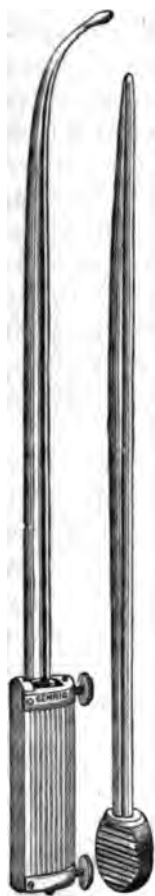
3. When a stricture is so tight as to give rise to considerable difficulty in its penetration, especially when it is of an obstinate, sensitive, or of a contractile nature; when the case is complicated by false passages, or when the patient is unable or unwilling to subject himself to the slower method of gradual dilatation, permanent or continuous dilatation becomes a valuable substitute. For this purpose, the pliant catheter, represented in fig. 18, p. 114, is retained in the bladder until it becomes loosened, which usually happens within the first forty-eight hours, the patient in the meanwhile being confined to his bed. It is important, with the view of guarding against pain and constitutional disturbance, that the instrument should merely fill, without overstretching, the obstruction, and that its beak should lie in the neck of the bladder, without entering that viscus. The original instrument, when loosened, is replaced by one several sizes larger, and the treatment is thus continued until the normal calibre of the urethra is attained.

In whatever manner the dilatation be conducted, whether gradually or continuously, it is of paramount importance, after the cure is apparently completed, to introduce occasionally a full-sized bougie as far as the bladder. This may be done, at first, every third or fourth day, then once a week, then every fortnight, and at length once a month. Where this precaution is neglected, little hope can be entertained of permanent palliation; and the practitioner has sometimes the mortification to find a relapse in a few weeks. Before the patient is finally dismissed, he should be taught the introduction of the instrument.

2. Rupture.—In rupture, splitting, laceration, divulsion, forcible dilatation, or the immediate treatment, as this method, which is generally known as that of Mr. Barnard Holt, of London, but was long ago practised by myself and others, is variously termed, the object is to lacerate the contracted part up to the full calibre of the normal passage, through which a splice, if the expression may be used, softer, more extensible, and less contractile than the tissues of the stricture, is inserted into the urethra. The instrument with which it is performed is some one of the improve-

ments upon the original dilator of Perrève, of which one of the most perfect is that of Dr. Richardson, of Dublin, represented in fig. 143. Having been passed closed, with the aid of the index-finger in the rectum, if necessary, into the bladder, a dovetailed plunger, which, with the expanded blades, equals the calibre of the urethra, as ascertained by previous measurement, is rapidly forced

Fig. 143.



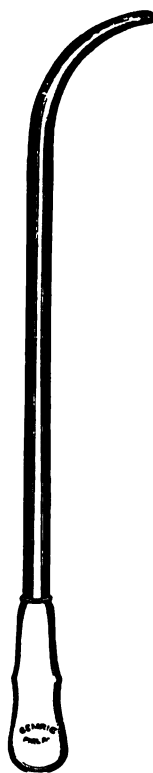
Richardson's
Tunnelled-Handled
Divulsor.

onwards between the blades, when the instrument is rotated several times so as to enlarge the rent, and withdrawn. The bladder having been evacuated with a catheter, ten grains of quinine and one-third of a grain of morphia are administered, with the two-fold object of preventing an attack of urethral fever, or mitigating its violence, if it should arise, and relieving pain, and the patient kept in bed for forty-eight hours.

When the stricture is so tight as to admit of the passage merely of a filiform bougie, the vesical extremity of the instrument may be perforated and grooved, through which it may be slipped over the bougie, acting as a guide, down to and through the obstruction. For this useful improvement on urethral instruments, the profession is indebted mainly to Dr. Gouley, of New York.

Instead of employing the ordinary form of dilator, I have for several years divulsed strictures with the heavy, conical, nickel-plated steel bougie, fig. 144, which from its point to its shaft represents six sizes of the French scale, the smallest running from 11 at the extremity to 16 at the shaft, and the largest from 25 to

Fig. 144.



Conical Steel
Bougie.

30, beyond which size I have rarely had occasion to go. Six of these instruments usually answer every purpose, and, while they act equally as effectual as the divulsor, by being rapidly inserted

one after another, they are, according to my experience, far superior to it, especially when the stricture is seated at the sub-pubic curvature, where, unless very great care is exercised, there is always danger in unskilled hands of the divulsor making a false passage.

The operation of rupture with either of these instruments may be said to be absolutely free from danger, unless there is advanced renal disease. It is never followed by serious hemorrhage, and what bleeding there is usually promptly ceases spontaneously. I have never known it to give rise to any untoward symptoms; it fulfils the same indications as internal urethrotomy; is applicable to all forms of stricture, and is especially available for resilient, irritable, and traumatic coarctations of the curved urethra, and it is more expeditious than, at the same time that it is as safe as, the apparently simpler procedures. For these reasons I do not hesitate to give it my unqualified approval. Internal incision is, however, preferable when the disease is seated at or near the meatus, and in the spongy portion anterior to the curve, and when the new deposit is thick and dense.

In conducting the operation there are two important points which cannot be too forcibly impressed upon the surgeon's attention, namely, that unless the laceration involves the mucous membrane, as denoted by the occurrence of hemorrhage, its object, which is to insert a splice into the contracted part, will be defeated; and, secondly, that a full-sized exploratory bougie should be passed with the view of detecting any bands that may have escaped the action of the divulsor. In the latter event, the operation should be completed with the urethrotome represented in fig. 146. Unless these points are carefully attended to, the procedure will not be followed by a permanent result, and will be brought into disrepute.

The after-treatment of rupture is conducted on general principles. At the expiration of forty-eight hours, a full-sized bougie is inserted, and the convexity of its curve pressed against the seat of the laceration, with a view of stretching the newly formed cicatricial tissue, and thereby preventing its contraction. The introduction of the instrument is subsequently repeated every second day until the healing process is perfected, which is denoted by freedom from hemorrhage and pain. If the stricture have

been thoroughly divided, I have every reason to believe, more especially in simple cases, that nothing more need be done; but if the coarctation is extensive and dense, as a matter of precaution, the bougie should be passed in accordance with the principles laid down in the preceding section.

3. Internal Urethrotomy.—All permeable strictures, whether simple, irritable, resilient, gonorrhœal, or traumatic, provided they are not complicated by great thickening and induration of the periurethral tissues, are best treated by internal incision; while for coarctations situated at the meatus and in the first four inches and a half of the spongy portion of the urethra, it is the only measure which holds out the slightest prospect for a radical cure. Rupture is equally applicable to the affection, when located at the subpubic curvature and its vicinity; but internal urethrotomy possesses the advantage of completely severing all resisting bands, some of which are liable to escape the action of the divulsor; thereby necessitating a resort to a cutting instrument to finish the operation, and thus afford immunity from relapse. I have performed the operation too frequently not to be convinced of its superiority, as to enduring results, over all other plans; and I have repeatedly had under my charge patients with simple stricture who had been subjected to ordinary dilatation for months and months, without any permanent benefit, and who were almost instantly relieved by it. In the absence of disease of other portions of the urinary tract, it is a perfectly safe procedure; while, if there be serious renal trouble, it is just as dangerous as, but not more than, other modes of treatment.

For strictures at or near the external orifice, the only instrument required is a narrow-bladed, probe-pointed bistoury, or tenotome, which is passed beyond the coarctation, so as to divide not only the diseased portion, but also about one-half of an inch of sound tissue on the floor of the urethra behind and in advance of it

Fig. 145.



Bistouri-Caché.

during its withdrawal. A convenient little instrument for the same purpose is the concealed bistoury of Civiale, sketched in

fig. 145. It consists of a small blade which may be protruded from its sheath by pressing upon the trigger, after the instru-

Fig. 146.



Dr S W Gross's
Urethrotome.

ment has been inserted, the extent of the incision being regulated by the screw at the handle. A full-sized conical bougie is then passed to separate still farther the edges of the rent, and hemorrhage is controlled by the insertion of a small pledget of lint, confined by a narrow strip of adhesive plaster. On account of the tendency to recontraction at this locality, a bougie should be passed daily until cicatrization is completed.

In the remainder of the canal, the stricture may be divided from behind forwards, or from before backwards. In the former procedure, which is the safer and more reliable, the stricture must previously be sufficiently dilated to admit of the passage of an instrument provided with a bulb, through which, on its withdrawal, the location of the coarctation is clearly defined, and its accurate division insured. To fulfil these indications, the most simple and perfect urethrotome with which I am acquainted is that devised by Dr. S. W. Gross, and represented in fig. 146. It is modelled after the exploratory bougie, and the bulb, which is conoidal in its configuration, carries a concealed blade, which may be protruded to the extent of one millimetre and a half beyond the level of the bulb, by sliding the button at the proximal extremity of the stem of the instrument. The bulbs themselves vary in

Fig. 147.



Civiale's
Urethrotome.

size, in accordance with the requirements of each individual case, the smallest corresponding with No. 10, and the stem with No. 6. In the larger instruments, the stem equals

No. 9. The entire length of the contrivance is ten inches and a half, of which two inches are taken up by the handle and the screw which confines the stylet carrying the blade on its retraction.

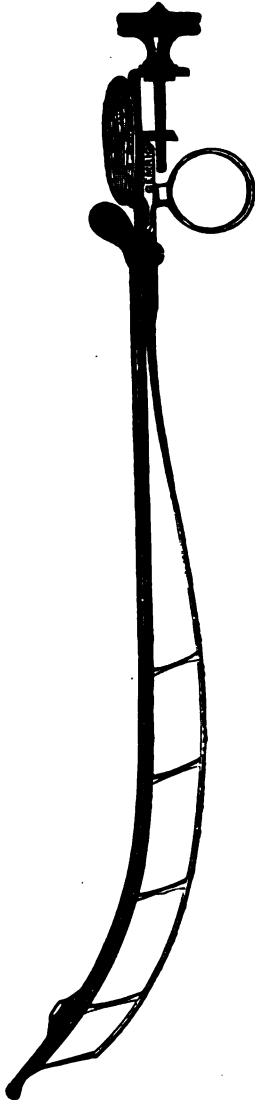
In the instrument of Civiale, fig. 147, which is so generally employed for retrograde urethrotomy, the bulb, in consequence of its flattened, olivary shape, and the absence of a well-defined shoulder, is not well adapted for defining a stricture, nor does it fill and stretch the urethra immediately behind it. The blade, moreover, projects much farther than there is any necessity for, unless the tissues are thick and resistant, in which event, its mechanism is applied by Dr. Gross to his acorn-headed urethrotome.

The stricture, if not one of large calibre, having been dilated to the requisite size, and its length determined by the soft exploratory bougie, the bulb of the urethrotome is carried beyond it, its passage being materially assisted, when the coarctation is seated far back, by the finger in the rectum, and the situation of the stricture accurately determined by advancing the bulb, the projecting shoulder of which catches against its posterior face. The penis being put upon the stretch, the bulb is then carried backwards, the object being to divide not only the stricture, but the sound tissues for half an inch behind and anterior to it, when the blade is projected and the parts severed. If there is much resistance on the withdrawal of the instrument, another incision should be made through the roof of the urethra. A steel bougie, of a size adapted to restoring the urethra to its normal calibre at the diseased part, is then passed, and its curve firmly pressed against the incision. On its removal, the exploratory bougie is inserted with the view of detecting any uncut bands, which, if present, should next be divided. The bladder having been emptied, the patient is put to bed, and a full dose of quinine and morphia exhibited.

Dr. Otis has devised what he terms a dilating urethrotome, fig. 148, for effecting the complete retrograde division of coarctations, whether seated in the curved or straight urethra. The stricture is overstretched by the separation of the blades, whereby it is rendered salient, and divided by retracting the guarded knife, which runs in a groove along the upper blade. The only objection to this instrument is that the position of the stricture has to be ascertained by previous measurement, which,

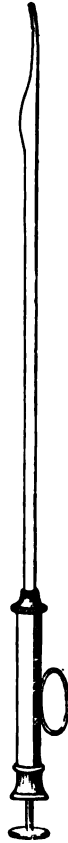
on account of the mobility of the urethra, is a most uncertain guide. The addition of a small bulb at the vesical extremity,

Fig. 148.



Dr. Otis's Dilating Urethrotome.

Fig. 149.



Author's Urethrotome.

Fig. 150.



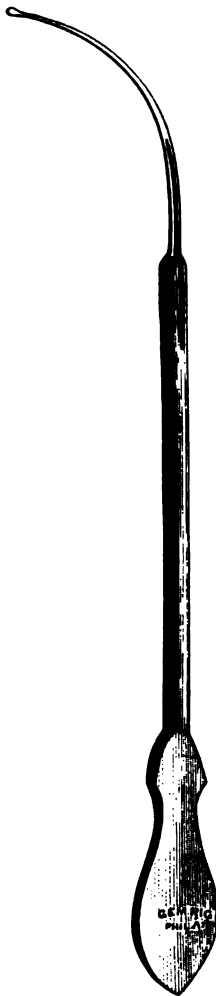
Trélat's Urethrotome.

for concealing the knife, and accurately defining the coarctation, would leave nothing to be desired in the way of a cutting instrument.

Incision from before backwards may be effected with the contrivance represented in fig. 149, which I have for many years been in the habit of employing, or with that of Trélat, fig. 150, the latter possessing

the additional advantage of cutting in an opposite direction, on its withdrawal, if such a procedure be deemed necessary. Whatever instrument may be selected, it is indispensable to safe practice that the vesical extremity, or guide, be fairly passed through the stricture before the blade is protruded. The operation is useful in tight or resilient strictures within the first four inches of the canal; but the general adoption of rupture has made its employment rare. It may be remarked that the in-

Fig. 151.



Syme's Staff.

struments found in the shops are unwieldy from their length, which should not exceed nine inches.

The subsequent treatment is conducted in accordance with the rules laid down in the section on rupture. If all resisting bands have been thoroughly divided, and a bougie of the size of the natural calibre of the urethra slips easily, by its own weight, into the bladder, without meeting with the slightest impediment to its insertion or withdrawal, after the wound has healed, I have every reason to believe that recontraction need not be feared, and that the subsequent methodical use of the steel bougie may be dispensed with, except at long intervals, as a matter of precaution.

4. External Urethrotomy.—The division of stricture from the perineum, includes two entirely distinct operations, that of external urethrotomy, conducted upon a guide, and perineal section, or external urethrotomy, without a guide. In the former procedure, the urethra is permeable, while, in the latter, it is impassable by an instrument.

a. In performing external urethrotomy on a guide, an operation which was originally described, in 1844, by Mr. Syme under the appellation of "external division," the anesthetized patient is placed in the lithotomy position, and Syme's staff, the construction of which is represented in fig. 151, is passed

through, and its shoulder, which corresponds to the point at which the small vesical extremity leaves the shaft, pressed against the face of the stricture by an assistant. The parts being shaved, the nates are brought close to the edge of the table, and the surgeon, sitting on a low chair, or resting upon one knee, makes his incisions exactly in the middle line of the perineum. Having divided the superficial structures, he feels for the shoulder of the staff, and taking that as a guide to the position of the stricture, enters the knife, the back of which is turned towards the anus, in the groove, an inch posterior to the shoulder of the instrument, and cuts as far forwards as the termination of the groove in the shaft. In this step of the operation he controls the staff with his left hand. The stricture, along with half an inch of the sound urethra in front and behind, having been completely divided, the shoulder of the staff may easily be carried onwards. Instead of proceeding in this manner, the operator may open the urethra in front of the shoulder of the instrument, and divide the contracted tissues from before backwards. The whole wound does not exceed an inch and a half, and occasionally it need not even be so large. Care should be taken not to divide the deep fascia of the perineum, and to keep as much as possible in the middle line, so that the bulb will be opened through its septum, whereby the risks of hemorrhage are reduced to a minimum.

A modification of this operation, and one which is said by Mr. Teevan,¹ and others, to be particularly applicable to cases uncomplicated by abscesses or fistules, is that known as sub-cutaneous urethrotomy, in which the stricture is divided on a grooved staff, with a straight, narrow-bladed knife, the external opening being confined to a mere puncture. This method also originated with Mr. Syme; but I am not aware that it is practised out of Great Britain.

In view of the danger of the formation of a false passage by the delicate inflexible staff of Mr. Syme, or of its entering a pre-existing false route, through which the urethra would escape division, Dr. Gouley² substitutes for it a filiform whalebone bougie, which being passed into the bladder, is utilized as a

¹ Trans. Clin. Soc. of London, vol. viii., 1875, p. 65.

² Diseases of the Urinary Organs, 1878, p. 122.

guide for his grooved catheter-staff. The peculiarity of this instrument consists, as shown in fig. 152, in the bridging over of its terminal quarter of an inch, by which the groove is converted into a canal, the bridged portion itself being also grooved. It is introduced by passing through the canal the free end of the bougie, which guides it onwards until its beak comes in contact with the stricture. The superficial incisions being made as in the ordinary procedure, the urethra is opened on the bridged portion of the staff, the latter of which is then slightly withdrawn so as to expose the whalebone guide, along which a straight probe-pointed bistoury divides the stricture and half an inch of the urethra behind it. The operation is completed by introducing the staff, still supported by the guide, into the bladder.

Whichever mode of operating may be adopted, it is of the last importance, after the stricture is divided, to pass the exploratory bougie, aided, if it be found necessary, by a broad grooved director, carried into the bladder through the wound, with the view of detecting any remaining bands, which if uncut, would render the whole procedure, at the best, merely palliative, instead of curative. The retention of a catheter for forty-eight hours, as advised by some surgeons, is not required, unless it should become necessary to plug the wound on account of hemorrhage.

Fig. 152.
Gouley's Grooved
and Tunnelled Catheter
Staff.

There are two most important circumstances which should claim attention after every operation of this kind; the first is, to regulate the general health, and the second, to insist upon the frequent use of the steel bougie, in order that the advantages gained may not be lost, or, what amounts to the same thing, that the stricture may not be reproduced. The same rules that govern the surgeon in the treatment of his patient after the operation by dilatation or incision are applicable here, and should always be most scrupulously enforced. The instrument should be passed, at first, at least once every third or fourth day,

and afterwards once a week, then once a fortnight, and finally once a month, until all danger of relapse is over. Horseback exercise, sexual indulgence, and stimulating food and drink should be carefully avoided; the bowels should be constantly maintained in a soluble state, and the strictest attention should be paid to the secretions.

The results of this operation, as far as they are known, are eminently encouraging, exhibiting as they do, a most extraordinary array of success. Of 108 cases in the hands of Mr. Syme, up to 1863, two only had ended fatally; and of 219 cases collected by Sir Henry Thompson, there was a mortality of 15, so that the death-rate may be placed at 5.16 per cent. The most fruitful source of death is pyemia.

The procedure should be reserved for extensive traumatic strictures, and for cases complicated by great induration and fistules. Relapses will be most likely to follow when there has been neglect in the after-treatment, and in old, worn-out, chronic cases, with a riddled perineum and a diseased condition of the urinary organs.

s. External perineal urethrotomy, without a guide, perineal section, or the button-hole operation, as the second procedure is variously termed, dates back to 1652, when it was first performed by Molins, an English surgeon. The etherized patient being placed in the lithotomy position, and a grooved staff, which is confided to an assistant, being passed down to the stricture, the surgeon opens the urethra by a free incision in the middle line, in front of the coarctation. The sides of the wound are then widely separated by tenacula or loops of waxed silk, so as to expose fully the face of the contraction, when attempts are made to insert a small, flexible, metallic grooved director, *fig. 153*, or a filiform guide into its opening, upon which the necessary division may be effected as in the preceding operation. Failing in these efforts, the surgeon carefully and patiently dissects through the thickened and indurated tissues until the urethra is opened below the stricture, after which a full-sized bougie is passed into the bladder, and the subsequent treatment conducted upon general principles.

Fig. 153.



Grooved Director.

This operation which is only adapted to impassable strictures, requires the most consummate skill for its successful execution, and should never be undertaken unless the surgeon has a profound knowledge of the anatomy of the parts, and a thorough acquaintance with the use of instruments. Unless it is complicated by advanced disease of the kidneys or bladder, it is not very lethal. I have myself performed perineal section 26 times with only one death, and of 43 cases, from the practice of Jameson, Rogers, Warren, and Gouley, all were successful. In the hands of German and French operators, however, the results are not so good, since of 35 cases collected by Boeckel, 8, or 22.85 per cent., were fatal.

Stricture of the Urethra in the Female.—Stricture of the urethra in the female is exceedingly infrequent. As in the male, it may arise from gonorrhea or chancre; but it is most commonly caused by contusion, the effect of the pressure of the child's head in parturition, or the maladroit use of the forceps.

The obstruction may occur at any point of the canal, but in most instances it is seated just behind the external orifice, where it presents itself in the form of a narrow, annular constriction. Occasionally the stricture is several lines in length, and in a few rare instances, one of which came under my own observation, it has been found to occupy the entire canal from one extremity to the other.

The symptoms and effects, local and general, do not differ from those of stricture in the other sex, and they do not, therefore, require any particular notice. The treatment is also similar, the proper remedy being internal urethrotomy, practised with a tenotome and grooved director. Dr. Newman,¹ of New York, has recently advocated the electrolytic treatment of stricture in the female; but from the unsatisfactory results afforded by galvanism in the same affection in the male, it is scarcely probable that this measure will command more than passing attention.

¹ American Journ. of Med. Sci., Oct. 1875, p. 433.

CHAPTER III.

INJURIOUS EFFECTS OF OPERATIONS ON THE URETHRA.

THE different methods of treating stricture, described in the preceding chapter, are all liable, however carefully or judiciously conducted, to be followed by very serious and even fatal consequences. It is well known that patients, especially such as are very nervous and irritable, occasionally suffer most violently from the most trifling operations upon the urinary organs, the mere passage of a bougie, sound, or catheter inducing violent rigors, excessive prostration, and other unpleasant symptoms. Indeed, a large number of cases are upon record, in which death was produced by this cause, even when there was no severe disease; and there are few practitioners, of any experience in this branch of surgery, who have not witnessed the distress, local and constitutional, which healthy persons often suffer from an attempt to pass an instrument into the bladder. The sensibility of the urethra is naturally very great, and hence it is not surprising that the contact of a bougie, however slight, should occasionally be followed by great pain in the part, nervous prostration, and other disagreeable effects. Fortunately, all persons are not constituted alike in this particular, otherwise these effects would be of much more frequent occurrence than they are found to be in practice. The treatment of stricture, however, is peculiarly liable to be attended with rigors, urethral fever, suppression of urine, and pyemia, owing to the fact that many, if not most of the subjects of this disease, are remarkably prone to renal and vesical disorders, and, therefore, easily affected by the most trivial operations performed for its relief.

a. Urethral Fever.—Unless particular attention has been paid to the preliminary treatment, both local and general, operations upon the urethra are liable to be followed by a peculiar reaction, as denoted by the occurrence of rigors, with or without subsequent febrile action, to which the term urethral fever is commonly applied. A fit of shivering should never be overlooked, since it is often a premonitory sign of uremic accidents or pyemia,

and no reliable conclusion can be drawn from the interval between the operation and its occurrence, as to whether it merely foreshadows reflex or morbid reaction.

Apart from pyemia, rigors denote at least three essentially different conditions, or have a threefold origin. In the first, and mildest, class of cases, temporary and irregular chilly sensations indicate a nervous, irritable state of the system. In the second class of cases, an attack of shivering comes on usually within the first twenty-four hours, and is rarely delayed beyond the second day. It is frequently due to tying in a catheter, and is not uncommonly coincident with the first passage of the urine over the sensitive, incised, or ruptured mucous membrane of the urethra. The chill is often violent and prolonged, and the temperature rises from two to eight degrees during its continuance. It is followed by fever and profuse sweating, and leaves the patient in an exhausted state. The paroxysm is usually single; the symptoms abate with more or less rapidity; and the patient soon regains his strength. This is urethral fever, properly so called, and corresponds with traumatic or surgical fever. In the third class of cases, the rigors, which come on within a few hours, are rapidly succeeded by signs of suppression of urine and uremic intoxication, such as headache, vomiting, diarrhœa, drowsiness or somnolence, thirst, scanty urine, pain in the region of the kidneys, lowered temperature, feeble pulse, and urinous odor of the secretions and excretions. These symptoms may disappear in a few days without farther trouble; or they may be succeeded by convulsions, coma, and death. In rare instances, they seem to culminate with great rapidity; and the case terminates fatally in a few hours.

The mortality after operations on the urethra is generally due to chronic Bright's disease or pyelitis. Hence, before entering upon any plan of treatment, the prudent surgeon will test the urine for pus, albumen, and tube-casts, the presence of which must, of necessity, modify his views in regard to the propriety of operative procedures. The occurrence of a chill, or succession of chills, and faintness, followed by fever and scanty urine, after each passage of an instrument, are signs which should awaken suspicion of chronic disorder of the kidneys. There is certainly no connection between the rigors and the size or location of the stricture, but they appear to be dependent, in the large majority

of cases; upon chronic Bright's disease, and the explosion of this extremely dangerous complication. In one form of that affection—contracted granular kidney—neither tube-casts nor albumen may be present in the urine to indicate latent or insidious renal trouble, so that it is by no means possible to determine whether rigors will occur or not.¹

Much may be done in the way of preventing the unpleasant nervous symptoms which occasionally succeed operations upon the urethra by judicious preparatory treatment, in accordance with the principles already laid down at page 470. Of the general remedies, which appear to exert some influence upon the prevention of a chill, quinine is the most efficacious, the system being brought gently under its action several days previous to the performance of an operation. I am in the habit of administering ten grains of the alkaloid immediately before the operation, which should be done under chloroform or ether, and injecting one-third of a grain of morphia under the skin at its conclusion. On no account should the patient be permitted to leave his bed before the expiration of two days.

¹ In his wards at the Philadelphia Hospital, during the past two winters, the editor had the misfortune to lose three patients after operations for stricture, in none of whom did appropriate tests detect the presence of tube-casts or albumen in the urine, and in whom the coarctations were of large calibre. In a man of 54, there were two strictures of a calibre of 16, located respectively at 3" and 5" from the external meatus. Their internal division was followed, in three hours, by a violent chill, which, in its turn, was succeeded by stupor and a very feeble pulse, and by another chill in twenty-four hours. The urine was scanty, and its secretion was totally suppressed for fourteen hours before the fatal issue. After the second rigor, there were headache, vomiting, diarrhoea, and pain in the hypogastrium; the skin was cold and moist, and the countenance presented a dusky purple hue. Death ensued, in a state of profound coma, in forty-eight hours from the date of the operation. Both kidneys were contracted and granular. In the second case, occurring in a man of 39, two strictures, seated 1½" and 2¾" from the meatus, and of a calibre of 16, were divided. A chill occurred in nineteen hours, and was followed by symptoms of uremic intoxication and death on the fourth day. The condition of the kidneys was precisely similar to that in the preceding instance. In the third case, a man of 61 was subjected to internal urethrotomy for two strictures, of which the first, of the calibre of 17, was seated 4½" from the meatus, and the second, of the calibre of 14, 6¼" from the external orifice. He had a violent chill in twenty-four hours, and died from suppression of urine on the fifth day. The right kidney was granular and contracted, and weighed less than one ounce, while the left kidney was enlarged, smooth, and white. A little urine, found in the bladder, contained casts, epithelial cells, and albumen, which could not be detected before the operation.

Rigors of the nervous type readily yield to a hot brandy toddy and rest in bed. When the chill is violent or prolonged, its severity may be moderated, and the subsequent hot stage be shortened, by the administration of a drachm of chloroform in emulsion. On its disappearance, a full dose of morphia will do much to make the patient comfortable, and subdue nervous and vascular excitement. Promptness of action is of the greatest importance, when uremic symptoms manifest themselves, the great indications being to maintain diaphoresis by Dover's powder, solution of acetate of ammonia, and the hot-air bath; to secure the activity of the intestines by saline cathartics; and aid in restoring the functions of the kidneys by dry cupping and hot fomentations. Convulsions may be controlled by the inhalation of chloroform, and coma be relieved by venesection, if the patient's general condition be fair, and the comatose symptoms come on rapidly.

a. Pyemia.—In another class of cases, a still more serious effect is occasionally witnessed, as the result of operations upon the urethra. I allude to the formation of matter in the joints, muscles, veins, connective tissue, and other structures. The patient is seized with rigors, which, after having continued for a variable period, are followed by profuse sweats and a sense of excessive prostration. The disease in fact, at its commencement, frequently resembles an attack of ordinary intermittent fever, or the paroxysms sometimes recur twice or thrice in the twenty-four hours. Occasionally, again, it closely simulates an attack of rheumatism, especially when there is intense pain in the joints and limbs. In whatever manner it makes its appearance, the case soon assumes a most threatening character. The pulse becomes small, frequent, and feeble, the appetite declines, the stomach is irritable, the bowels are costive, the urine is scanty and high-colored, and there is excessive thirst, with constant restlessness and great anxiety of mind. Delirium and stupor generally set in at an early period, and constitute prominent phenomena of the complaint.

The symptoms now described may come on within a few hours after the operation, of which they are the consequence; but, in general, they do not show themselves under three or four days, at all events not with any degree of severity. They soon assume a typhoid character, and few patients survive beyond ten days

or a fortnight. The formation of matter is usually preceded and accompanied by an erysipelatous blush of the skin, by exquisite tenderness of the part, and by great impediment of motion. The pus, which often exists in considerable quantities, either as a simple collection, or in the form of distinct abscesses, is commonly of a sanious and unhealthy character, and sometimes highly fetid. The structures which are most liable to suffer are the joints, as the knee, ankle, hip, and shoulder, the muscles and connective tissue of the extremities, the perineum, and scrotum, the connective tissue and veins of the pelvis, the liver, and spleen. The number of abscesses is sometimes very great, and, when this is the case, they are always proportionately small.

Pyemia does not always run the acute course here spoken of. In some cases, as pointed out by Sir James Paget,¹ it is decidedly chronic and even relapsing, extending over weeks and months. Its progress is much slower, and its results far less fatal, than those of the acute form of the affection, from which it also differs in the more frequent occurrence of abscesses in the limbs and trunk than in the internal organs.

A peculiar and localized form of pyemia has been described by Dr. W. H. Dickinson,² and is sometimes spoken of as "surgical kidney." It consists of the formation of abscesses, along the course of the veins, in the renal interlobular connective tissue, which is congested and friable, while the straight tubes are dilated, and their accompanying vessels distended or occupied by emboli. "The disorder has its origin in the regurgitation of urine charged with morbid deposits. This occupies and generally distends the straight ducts, and thence enters the neighboring bloodvessels, and charges them with an infection resembling in its results that of pyemia. This is distributed by the veins to the rest of the gland, sowing abscesses in their course, and ultimately causing constitutional symptoms analogous to those of pyemia when otherwise derived." The symptoms, which are always associated with those of pelvic and vesical inflammation, are those of blood-poisoning, and bear a general resemblance to those of pyemia, although other organs

¹ Clinical Lectures and Essays, p. 155, London, 1875.

² London Lancet, March 8, 1873.

or tissues seldom take part in the suppuration. The affection usually ends fatally within three weeks, and is, next to Bright's disease, the most common cause of death after operations upon the urethra.

The treatment of pyemic symptoms is sustaining, stimulant, and soothing; brandy, good food, fresh air, careful nursing, quinine, and opium, being the remedies upon which the greatest reliance is to be placed. When there is disseminated suppuration of the kidneys, the ammoniacal and putrid decomposition of the urine must be prevented, by preserving the natural acidity of that excretion. Arthritic symptoms, and the formation of matter in the connective tissue, joints, muscles, viscera, and veins, must be met by leeches, blisters, iodine, and fomentations, medicated with acetate of lead and laudanum, and by the internal use of calomel and opium. Superficial abscesses must be opened by early and free incisions.

CHAPTER IV.

HEMORRHAGE OF THE URETHRA.

HEMORRHAGE of the urethra, although not very common, is always alarming to the patient and a source of embarrassment to the practitioner. It occurs under two varieties of forms, the spontaneous and the traumatic, of which the latter is by far the more frequent. When the mucous membrane is in a varicose condition, or abnormally soft and vascular, as it sometimes is in consequence of protracted congestion, the slightest cause is frequently sufficient to bring on a discharge of blood. Under such circumstances, it is hardly possible to introduce a catheter, a bougie, or a sound, without inducing some degree of bleeding.

The spontaneous form is most common in old and middle-aged persons, who have led a life of irregularity and debauch, and labor under habitual relaxation of the lining membrane of the urethra. In such individuals, the slightest erection, straining at stool, or horseback exercise, is sufficient to bring on an attack. Frequently, indeed, it makes its appearance without any assignable cause whatever, perhaps while the patient is lying in bed, or walking about. I am occasionally in attendance upon a gentleman, about thirty-six years of age, who has had repeated discharges of this kind, without having been able, in a solitary instance, to trace them to any particular agency. The discharge, in him, is usually of a dark modena color, small in quantity, and of short duration. Spontaneous hemorrhage here, as elsewhere, is generally the result of a process of exhalation, and proceeds, from the prostatic portion of the canal.

Traumatic hemorrhage arises from various causes. Most frequently, it depends upon violence inflicted upon the urethra by the passage or lodgment of a urinary concretion, the introduction of an instrument, as a catheter or bougie, or an attempt to force a stricture. It is a very common consequence of injury of the perineum; and it often follows the operation of cauterization. Hemorrhage of the urethra occasionally complicates the acute stage of gonorrhœa as the result of a rupture of some

of the vessels of the lining membrane from chordee, or the act of coition. A frightful and even fatal hemorrhage has occasionally been produced by masturbation. It may also be caused by ulceration, or the presence of a chancre.

The quantity of the effused blood varies from a few drops to several ounces. Although it is generally greatest in cases of laceration and ulcerative perforation of the tube, it is sometimes not less abundant when it has its source in a slight abrasion of the lining membrane. The most abundant hemorrhages usually proceed from the posterior part of the urethra, probably on account of the greater vascularity there, both of the mucous tissue and of the surrounding structures. It is not often that the bleeding, under any circumstances, is very copious, or that the blood issues rapidly, or in a full round stream. I have, however, seen several cases in which the hemorrhage was so great as to produce serious exhaustion, and where, if it had not been promptly arrested, it might have terminated fatally.

The color of the effused fluid varies from bright scarlet to black, or modena. In spontaneous hemorrhage, it is generally, at least according to my own experience, of a venous complexion; whereas, in the traumatic form, it is commonly of an arterial hue. Contact with the urine always renders it preternaturally dark.

When the hemorrhage is caused by violence, and has its source high up in the urethra, the blood may regurgitate into the bladder, where, from its contact with the urine, it soon coagulates, and often leads to retention. When, on the contrary, it has its rise in the anterior portion of the canal, the fluid generally escapes externally, either in a slow, trickling manner, or in a tolerably full stream. Sometimes the blood coagulates in the urethra, forming a long, cylindrical plug, accurately representing the size and the shape of the canal, and of sufficient firmness to be pulled away without breaking.

Bleeding of the urethra seldom requires surgical interference; in most cases it ceases spontaneously, or is easily arrested by repose in the horizontal posture upon a hair mattress, iced drinks, and pressure, for a few minutes, upon the perineum, directly opposite to the part from which the blood proceeds. This may be made either with the finger, or by means of a twisted towel, rolled up and applied firmly against the canal.

In employing pressure, it is a matter of great moment that it be made properly, otherwise it will not only be useless, but decidedly injurious. It is not always easy to hit the precise spot from which the blood issues; hence the finger must be moved about from one part to another until the object is attained. If the pressure be applied in front of the seat of the hemorrhage, there is great probability that it will continue, and that the blood will pass back into the bladder, constituting thus a case of concealed hemorrhage, similar to that which is occasionally met with in the uterus. Such an occurrence might not only prove dangerous, but fatal. On the other hand, the pressure must not be made behind the affected part, for this proceeding, although not attended with the same risk, would be equally futile. The course which I generally pursue is, to place the finger upon the part from which the blood is supposed to proceed; holding it there for a few seconds, I ascertain whether it arrests the bleeding; if it do, I remove it, and apply it a little farther back; if the finger was upon the proper spot in the first instance, there will immediately be a recurrence of the hemorrhage, and the seat of the pressure is instantly changed accordingly.

A cold enema sometimes puts a sudden stop to it; and another excellent expedient is the application of pounded ice to the perineum, or the perineum and hypogastrium. Care, however, must be taken, in the use of the latter agent, that it be not continued too long, lest it produce chilliness, followed by violent reaction. Benefit may also be expected, in some cases, from injecting the urethra with cold water, or some astringent lotion, such as a solution of subacetate of lead, alum, gallic acid, or creasote. The fluid should be thrown up as high as possible, in a full stream, and the operation should be continued for a considerable length of time, or until there is reason to believe that the relaxed or ruptured vessels are completely constricted.

When the case is obstinate, and the more ordinary remedies have failed, recourse must be had to compression by means of a full-sized elastic catheter, introduced into the bladder. The mere contact of the instrument frequently suffices to arrest the flow of blood; but should this not answer, counter-pressure is made with the finger, a bandage, adhesive strips, or when the hemorrhage is deep-seated, with a compress and roller.

The best internal remedy in hemorrhage of the urethra, is gallic acid, in doses of from three to five grains every two or three hours. Where the case is urgent, it may be given more liberally, in combination with opium. Exhibited by itself, in large doses, it is apt to create nausea and vomiting, and to fail in producing the desired effect. In the spontaneous variety of this affection, gallic acid generally acts like a charm, completely arresting the flow of blood in a few hours. In the traumatic form, although not equally efficacious, it rarely fails to be of signal benefit.

Another excellent remedy in this affection, is the subacetate of lead in combination with opium; three grains of the former with one of the latter should be given every three hours, and continued until the necessity for its exhibition ceases. Alum is another valuable agent in this affection. It should be administered in doses of from thirty to sixty grains every two or three hours. Employed in smaller quantity, little benefit is to be looked for. In very obstinate cases, there are perhaps no articles that hold out greater prospect of success than spirit of turpentine and the tincture of the chloride of iron, in doses of ten drops each, repeated every hour.

CHAPTER V.

FALSE PASSAGES OF THE URETHRA.

A FALSE passage is an artificial canal, communicating with the urethra, and generally produced by the injudicious use of instruments. All portions of the canal are subject to it, but it is most frequent in the membranous and prostatic, owing to the inequality of their surface, and their fixed position beneath the pubic symphysis. A false passage sometimes occurs at the sinus of the bulb from the point of a catheter being arrested in it; and for the same reason it occasionally commences in one of the numerous follicles of the lining membrane. The accident, however, is generally produced in consequence of the existence of a stricture, in attempting to overcome which the instrument leaves the natural channel, in front of the obstruction, and makes a new one. In cases of chronic enlargement of the prostate, the substance of this gland is occasionally perforated, to afford an exit to the urine.

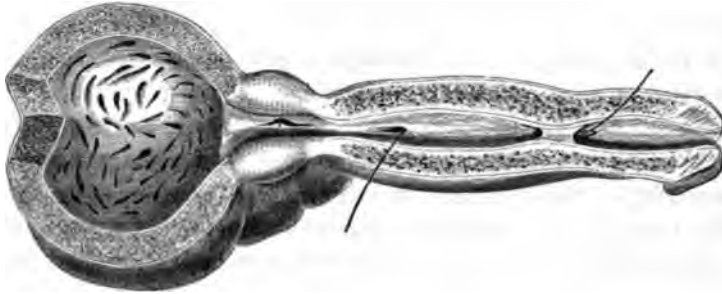
False passages are much more easily made than is generally believed, and it is only surprising, when we reflect upon the want of anatomical knowledge and dexterity in the use of instruments, that they are so seldom met with. When the mucous membrane is softened, or chronically inflamed, as it frequently is in firm, semicartilaginous strictures, it often yields under the slightest pressure, and hence it is not unlikely that the accident occasionally occurs when it is not in the least suspected.

The artificial route is commonly situated at the inferior surface of the canal, chiefly because when an instrument is attempted to be introduced into the bladder, its point is almost always pressed in this direction, which also presents the greatest number of natural obstacles to its easy passage. Sometimes the perforation occurs at the sides of the urethra and occasionally also, but rarely, at its superior surface.

The length of the artificial route, which is usually single,

varies from a few lines to several inches. In a specimen in my private collection, from which fig. 154 is taken, it was three inches and a half, and lined by a false membrane. Generally speaking, however, these false routes are comparatively short, not exceeding, perhaps, ten, fifteen, or twenty lines.

Fig. 154.



Stricture of the Urethra, with False Passage; Enlargement of the Prostate Gland, and Hypertrophy of the Bladder.

False passages occur under different varieties of form, of which the following are the principal: 1. The most simple, and generally also the least dangerous form, is where it presents itself as a cul-de-sac, or blind pouch, running parallel with the urethra, from which it is often separated merely by the mucous membrane: it varies in length from a few lines to several inches, and may occur in any portion of the canal, although it is most frequent at its posterior part. 2. In a second variety, the false route, after having extended a certain distance, communicates again with the urethra, which is thus perforated at two distinct points. The abnormal channel, in time, becomes lined by an adventitious membrane, and often performs the functions of the original one. 3. The passage communicates with the bladder. This variety, which is by no means infrequent, is usually the result of an attempt to force a stricture at the subpubic curvature; in which the point of the instrument passes out of the natural channel into the connective tissue between the rectum and the bladder, and thence on into the latter organ. In some instances, the catheter perforates the substance of the prostate, runs round its side, or proceeds along its upper surface. Whatever course the instrument may take to reach the bladder, the occurrence is always one of great danger, from its liability to be followed by

infiltration of urine, and the whole train of evils which such an accident is capable of inducing. 4. In a fourth variety, the passage communicates with the rectum. That such an occurrence should occasionally happen, in the hands of an ignorant or unskilful practitioner, it is not difficult to imagine when we reflect upon the little force it requires to lacerate the urethra, the yielding nature of the connective tissue between the bowel and the bladder, and the close proximity of these two reservoirs to each other. Much as the accident is to be deprecated, it is a remarkable fact that it is rarely followed by anything serious; the track neither admits urine nor fecal matter, and, in fact, usually closes in a few hours. 5. Authors mention a fifth case, in which the abnormal route opens both into the rectum and the bladder. To produce this result, it is necessary that the vulnerating body should, in its onward passage, pierce the bowel twice, entering it at one point, and emerging at another to reach the latter viscus. An occurrence like this, of which a remarkable example is related by Deschamps, might be followed by severe inflammation, and possibly, also, by a recto-vesical fistule. 6, and, finally, an instance is upon record where the false route extended from the urethra to the ischium.

A false passage, in its recent state, is merely a laceration of the mucous membrane and the neighboring tissues, which either heals within a short time after it has been made, or it continues open, and becomes lined by an adventitious membrane, differing in no material respect, except in the absence of mucous follicles, from the natural structure. In time, the new channel may usurp the place of the original, which, as it has no longer any functions to perform, gradually diminishes in size, and is occasionally, especially in protracted cases, nearly obliterated.

The immediate cause of this lesion, as was previously intimated, is undue force, or misdirected pressure, exerted in the act of dilating a stricture, cauterizing the urethra, drawing off the urine, or sounding the bladder. An instrument of some kind or other is indispensable to its production; and hence it is almost needless to add how important it is for the surgeon to be upon his guard whenever he attempts any operation, however simple, upon the canal under consideration. To avoid the formation of a false passage, he should not only be acquainted with the urethra in its healthy and diseased states, but he should have a most

thorough knowledge of the nature and uses of the various instruments which are designed to traverse it, whether for its own benefit or for the relief of the prostate gland and the bladder.

The predisposing causes of this lesion may be arranged under two heads, the natural and the accidental. A brief enumeration of these circumstances will not be without its benefit, for it will serve as a beacon to warn us of the danger of the heedless and injudicious use of instruments in the treatment of urinary affections.

The natural causes are the lacuna magna, the orifices of the mucous follicles, the sinus of the bulb, the margins of the triangular ligament, the anterior border of the prostate gland, and the sinus pocularis; and, it is worthy of remark, that these obstacles to the easy introduction of the catheter nearly all exist along the inferior surface of the canal. Hence, to avoid them, the instrument should be gently pressed against the upper part of the urethra, after its first inch and a half are traversed, by which its beak will be made to glide past these obstacles without any danger of being intercepted by them. Care should also be taken that the extremity of the instrument be not too pointed, as this will render it more liable to become entangled in the folds of the lining membrane or in the mouths of the mucous follicles.

The accidental causes, predisposing to the formation of false passages, are, first, an inflamed, softened, or ulcerated state of the mucous membrane; secondly, a preternatural development of the mucous follicles, or the excretory ducts of Cowper's glands and the prostate; thirdly, the existence of a tight, narrow, semi-cartilaginous stricture; fourthly, a deviation of the urethra from its natural direction; and, fifthly, the nature and form of the instrument used in our operations.

It does not require much foresight to perceive that the mucous tissue of the urethra, when in a state of disease, will be much more likely to give way, under the pressure of a bougie or catheter, than when it is perfectly healthy. The existence, therefore, of ulceration or softening of the lining membrane of this canal may be justly regarded as a predisposing cause to the formation of a false passage. The same is true of an unnaturally large follicle, and of a firm stricture. The situation of a stricture also exerts an important influence upon the production of this lesion. The deeper it is situated the less manageable is it generally found

to be, and the more likely, therefore, will be the instrument to tear the urethra. A deviation of this canal from its natural direction is by no means rare; I have seen several remarkable examples of it, and have never known one which did not seriously embarrass me in my efforts to introduce an instrument into the bladder.

Much also depends upon the form and character of the instrument used in our operations. A flexible catheter or bougie is less likely to produce mischief than a metallic one; a blunt, than a conical one; a curved, than a straight one. Finally, a great deal depends upon the character of the surgeon; whether he is skilful or ignorant, patient or hasty, gentle or rough.

The effects of a false passage vary according to circumstances. When it consists of a mere cul-de-sac, little or no harm generally results. The slight inflammation which succeeds its formation usually subsides in a few days, and is just sufficient, in most cases, to cause adhesion of the opposite sides of the artificial channel. The reason why the accident so frequently occurs, even far back in the canal, without being followed by extravasation of urine, is that the fluid does not find an easy entrance, on account of the valve-like opening in the mucous membrane, and the oblique direction of the passage from before backwards, which is the reverse of the natural stream. When the route exists in the vicinity of the bladder, or when it communicates with this reservoir, the danger may be very great, for it may then give rise to infiltration, abscess, and even gangrene. When it extends into the rectum, or the rectum and bladder, a permanent fistule may follow.

The formation of false passages is seldom indicated by any reliable symptoms, and the consequence is that it often occurs without being suspected either by the patient or the surgeon. The most constant evidences are, hemorrhage, pain, and a feeling of laceration; but, if these be examined in detail, it will be found, as has been just intimated, that they are of no value whatever as diagnostics. More or less bleeding, for example, may follow any operation upon the urethra, however gently or skilfully conducted. This is true of this canal both in its healthy and diseased states. Every surgeon of experience has seen cases in which the slightest touch with a bougie or catheter has been followed by a tolerably smart hemorrhage. No just inference

can be deduced from the nature and amount of the pain consequent upon such an injury, for the greatest possible diversity prevails, in this respect, in different individuals, depending upon the natural or morbid sensibility of the canal, the state of the system, and the extent of the laceration. It has been said that, in a false passage, it is of a stinging, pricking character; but this is not always true, on the one hand, and on the other, it is equally certain that the same kind of suffering frequently attends the dilatation of a stricture. Finally, the tearing sensation, complained of by the patient, is altogether deceptive; for it is often experienced when no laceration has taken place. On the whole, then, no confidence whatever can be placed in any of the symptoms furnished by the patient. The only circumstances worthy of notice, as far as the surgeon is concerned, are, first, a peculiar grating sensation communicated to his hand, while engaged in operating upon the urethra; secondly, a sudden slipping of the instrument from its position, or a feeling as if something had given way; thirdly, a deviation of the instrument from the normal direction of the canal; and, fourthly, the detection, by the finger in the rectum, of the point of the instrument much nearer the anterior wall of the gut than it should be, if it does not actually lie in contact with it, from perforation of the urethra. When these accidents occur, the surgeon should at once desist, and finish his operation at some future period.

The treatment of false passages must be conducted upon general principles. Hemorrhage must be arrested, pain allayed, and the use of instruments be avoided for a fortnight, when the opening will have closed. Rest in the recumbent posture, light diet, purgatives, antimonials, leeches, fomentations, and the warm hip-bath will, in general, put a speedy stop to the local inflammation. The false route, if complete, and consequent upon the presence of an impermeable stricture, will become gradually lined by an adventitious membrane, and in a short time take the place, and perform the office, of the obliterated part of the urethra. Should retention of urine occur, and resist the ordinary means of avoiding a false passage, as described at page 476, relief must be attempted, either by performing external urethrotomy, without a guide, if this be deemed advisable or practicable, or by puncturing the bladder. If the symptoms indicate the existence of urinary infiltration, early and free incisions must be made, followed by anodyne fomentations, and the usual internal means.

CHAPTER VI.

INFILTRATION OF URINE.

By the term "infiltration," as applied to the urine, is understood an escape of this fluid from the urethra, and its diffusion through the surrounding tissues. The accident is always a most unfortunate one, on account of the serious effects to which it is sure to give rise. The urine, rendered acrid by disease, or by its protracted retention in the bladder, no sooner comes in contact with the tissues into which it has escaped than it lights up violent inflammatory action, which rarely ceases but with their destruction. The fluid in fact, instead of being an unirritating and harmless substance, as it is when it is confined within its proper reservoirs, now that it has become unpent, plays the character of a virulent poison, both to the part and to the system. In a few hours after the infiltration has taken place, excessive action is set up; the pain is of a sharp, burning, stinging nature; the skin, which presents an erysipelatous blush, is hot, dry, and exquisitely tender to the touch; the swelling is great and rapid; micturition soon becomes impracticable, if it was not already so at the beginning; and there is high constitutional excitement, with a rapid pulse, dryness of the surface, intense thirst, excessive restlessness, headache, and delirium. As the case proceeds, the affected parts assume a black, livid appearance, crepitate on pressure, and are deprived of their vitality; a urinous odor exhales from the infiltrated structures, and sometimes even from the whole body; and the patient sinks into a low, typhoid condition, which is speedily followed by hiccough, twitching of the tendons, cold clammy sweats, the Hippocratic countenance, deep coma, and death. The period at which the latter event occurs varies from four to six or eight days, according to the extent of the infiltration, the acidity of the urine, the resulting inflammation, and the state of the system at the time of the accident. In some instances, the smallest quantity of urine, not, perhaps, exceeding a few drops, is suffi-

cient to produce the most violent symptoms in four or five hours, followed by mortification and death in a few days; while in others, the effusion may be much more extensive and yet the effects be much more mild. Generally, however, the inflammation is of the most severe character, and is followed by the worst consequences.

The cause under which infiltration of urine usually takes place is a laceration of the urethra, either in consequence of external violence, severe straining during micturition, as in stricture, the passage of a urinary calculus, or the maladroit use of instruments, as the catheter or bougie. When the canal is ruptured far back by a fall astride a chair, a blow, or a kick, infiltration of urine is almost inevitable. The accident is sometimes produced by violent straining in attempts to void the urine, on account of the obstacle afforded by a tight, callous stricture. In this affection, the portion of the urethra behind the obstruction is often remarkably dilated, softened, and attenuated, if not ulcerated, and therefore liable to give way under any unusual effort at micturition; the more so, because the muscular fibres of the bladder are generally at the same time very considerably hypertrophied. When the rupture follows upon such a cause, the urine is sent abroad into the connective tissue with great force, as if it had been discharged from a syringe, and gives rise to the most disastrous consequences.

If the rupture takes place in the commencement of the membranous portion of the urethra, behind the triangular ligament, the case may remain obscure for several hours or even days; there is little or no prominence in the perineum from swelling, the scrotum is uninvolved, and the patient may not have been conscious of a sense of yielding, as he is when the bladder gives way. The urine is deep-seated, and may burrow extensively before it declares itself externally. The most reliable symptoms of the mischief that is going on, are, pain and throbbing deep in the perineum; difficulty, or utter impossibility of voiding the urine, with, perhaps, a frequent desire to do so; a sense of fulness in the anus and rectum; tenderness in the hypogastrium; and extraordinary constitutional disturbance. By and by, the urine makes an effort to approach the surface, its progress being preceded and accompanied by heat, pain, redness, and swelling, and by a rapidly increasing typhoid state of the system. In

some instances, the first evidence of such an attempt, on the part of the fluid, is the appearance of a certain amount of tumefaction and discoloration, at first red, and then purple, of the gland of the penis; showing that the urine has obtained admission into the spongy structure of this organ, and that it is slowly but surely extending its ravages.

If the rupture occurs in that portion of the urethra which lies in front of the triangular ligament, between it and the bulb, the urine escapes into the connective tissue of the perineum, and proceeds forwards and upwards underneath the dartos into the scrotum, which it often pervades through its entire extent. In its progress, it may travel along the subcutaneous tissue of the penis and the groins, over to the pubes, and sometimes even as high up as the umbilicus, or even the chest. The passage of the fluid is commonly indicated by a reddish, erysipelatous blush, which, on the approach of mortification, is generally replaced by a dark, livid, or black appearance of the skin. The swelling of the perineum, scrotum, and penis, in fact of all the parts here mentioned, is sometimes excessive. The reason why the urine does not, in this variety of rupture, extend backwards towards the neck of the bladder, around the anus, or downwards along the thighs, is the manner in which the triangular ligament and superficial perineal fascia are attached to each other and to the edges of the branches of the pubic and ischiatic bones. There are, however, notwithstanding this arrangement, cases in which it breaks through these barriers, and spreads backwards upon the nates and the ischio-rectal fossæ, and downwards along the inner surface of the thighs, perhaps to a distance of many inches. In the worst forms of this affection, not only the scrotum, but the skin of the penis, the groins, and the upper parts of the thighs fall into gangrene, and the testicles, thus completely denuded, are suspended merely by the spermatic cords and vessels.

Urinary infiltration of the scrotum is liable to be confounded with ecchymosis of this organ, the more so, because both affections are frequently produced by the same accident, namely, a fall or blow upon the perineum. A careful examination of the part, however, and an attentive consideration of the history of the case, will generally enable us to distinguish the two affections. In ecchymosis, the swelling and discoloration come on within a few minutes, or, at furthest, a few hours, after the

occurrence of the injury, and are caused by an extravasation of blood from a rupture of some of the scrotal vessels. The patient is in great pain, and cannot void his urine, although he is compelled to make frequent efforts to do so; the parts are more or less distended by the effused fluid, and the skin is of a dark, livid, or purple color. The pain in ecchymosis is usually milder than in urinary infiltration, the constitutional excitement is also less, and there is an absence of the peculiar erysipelatous blush which generally precedes and accompanies the march of extravasated urine.

The symptoms of infiltration of urine are occasionally most painfully simulated by a form of erysipelas of the scrotum and penis, which was originally described by Mr. Liston under the name of "inflammatory œdema," and is liable to attack persons of intemperate habits and dilapidated constitutions. The affection, which progresses rapidly, is attended with enormous swelling of the scrotum and penis, of a glossy-reddish aspect, very painful, and pitting deeply on pressure. The patient is pale, feeble, and dejected; the pulse is small, quick, and tremulous; the respiration is frequent and embarrassed; the strength soon gives way; micturition is difficult; and if relief is not promptly afforded, gangrene ensues. The diagnosis is based upon the history of the case, the absence of previous urinary trouble, the rapidity and great extent of the swelling, and the facility with which the catheter is passed.

The prognosis of infiltration is seldom flattering, although apparently the most desperate cases occasionally recover. Much will necessarily depend upon the nature and extent of the lesion which gives rise to it, the state of the system at the time of the injury and the promptness and judgment with which the accident is managed in its earlier stages. If the urethra is extensively lacerated, so that little or no urine can pass off in that direction; if the patient is old or dilapidated at the time the mischief is inflicted, and if the extravasated fluid has become extensively diffused, little hope is to be entertained of a favorable issue. Death will be likely to happen in spite of all that can be done. The case is generally regarded as desperate when the urine is extravasated into the spongy body of the penis; an occurrence which is commonly preceded by severe pain and tenderness of the part, and a livid discoloration of the head of the organ.

Balarina mentions a case of recovery where there was sloughing not only of the integuments of the penis and scrotum, but of the connective tissue of the loins and abdomen, as high up as the umbilicus, and of the thigh as far down as the knee. The patient had a good constitution, and proper counter openings were made.

The treatment of infiltration of urine must be prompt and energetic, otherwise serious mischief, if not loss of life, will be the result. The first, and in fact almost the only thing, to be done, in the early stage of the affection, is to make large and dependent incisions, to afford vent to the pent-up and irritating fluids, provide for the subsequent escape of the urine from the bladder, and also afford an outlet for pus and sloughs. The parts must be cut freely, not sparingly, at different points, and to as great a depth as is consistent with the safety of the large vessels of the perineum. The incisions should, of course, be made vertically, not obliquely, much less transversely. It is surprising to what an extent the affected parts may frequently be divided. Incisions that would shock an inexperienced or timid practitioner are borne with perfect impunity, and often heal with little deformity. In violent cases, mere scarification is worse than useless. The door must be widely opened, and the intruder must be forced out with a bold hand.

As soon as the distended parts have been freely and thoroughly divided, and the system has rallied, a gum-elastic catheter should be introduced into the bladder, and be allowed to remain there during the cure. The urine is thus enabled to pass off as fast as it reaches the bladder, and is thereby prevented from doing further mischief. The gum-elastic catheter is preferable, in these cases, to a silver one, on account of its greater softness and pliancy, which enable it to accommodate itself more readily to the urethra, altered and distorted as it frequently is by the accompanying tumefaction. The introduction of an instrument of any kind is often attended with immense difficulty and is sometimes utterly impracticable.

The best local applications, after the parts have been properly incised, are warm fomentations of acetate of lead and opium, hops or poppy heads. They should be frequently renewed, and their heat and moisture should be maintained by oiled silk. When the sloughing process has fairly begun, the fomentations

may be advantageously superseded by emollient poultices, with the addition of yeast, port wine, nitric acid, or chlorinate of soda, properly tempered with water. When the eschars are detached, the sore is to be managed upon general principles. Throughout the treatment, the scrotum and penis are to be supported with a suspensory bandage. Should the parts remain fistulous, an operation may be required for their relief, but not until they have become thoroughly cicatrized in the neighborhood of the abnormal apertures. It is surprising, even when there has been the most extensive sloughing, how rapidly, in some instances, nature succeeds in repairing the injury. The testicles, as was before stated, are sometimes entirely denuded, or, perhaps, merely suspended by the spermatic cords, and yet, contrary to what might be supposed to happen in such cases, the breach is frequently closed in a very brief space with comparatively little deformity.

CHAPTER VII.

URINARY ABSCESS.

ABSCESSSES, to which the term urinary is usually applied, are liable to form in the connective tissue around the urethra, fig. 155, leading, if improperly managed to fistule and other mischief. The expression is a generic one, and is employed to designate any collection of pus, the exciting cause of which is an escape of urine from the urinary passages into a part which is unaccustomed to its presence, and which, therefore, never fails to resent the intrusion. Thus, a urinary abscess sometimes forms deep in the pelvis, in the perineum, or above the pubes, after puncture of the bladder, the operation of lithotomy, or injury of the bladder from a ball, sabre, or splinter of bone. As applied to the urethra, the term "urinary" is not sufficiently definite; for it denotes merely one circumstance in the history of this lesion, namely, the nature of the exciting cause. The nomenclature might be improved by the substitution of the word "urethral," or, still better, by the term "periurethral," inasmuch as it would serve to point out at once, not only the character of the affection, but likewise its situation.

The ordinary site of urinary abscess is the perineum, between the bulb of the urethra and the anus. A very common situation is the upper part of the perineum, just behind the junction of the cavernous bodies of the penis, and, consequently, at the inferior portion of the scrotum. The next most frequent point is the scrotum itself, and, lastly, the under surface of the penis. Instances are observed, although they are rare, in which the abscess forms at the side of the anus, at the nates, near the tip

Fig. 155.



Urinary Abscess.

of the coccyx, and at the upper and inner part of the thigh. It seldom happens that more than one such swelling occurs at a time. There may, however, be as many as two or even three.

The exciting causes of the lesion are various. The most common, perhaps, is the existence of a tight organic stricture of the urethra, attended with attenuation and dilatation of the canal immediately posterior to it. A sort of pouch is thus formed, in which the urine habitually lodges, fretting and teasing the mucous membrane until it produces perforative ulceration. However minute the opening may be, a small quantity of fluid is sure to insinuate itself into the subjacent connective substance, and to give rise to inflammation. Or, instead of this, the weakened and dilated part behind the seat of the obstruction may yield at one or more points during a violent effort at micturition, while the patient is, perhaps, straining with all his might to relieve the bladder of its accumulated load. A little crack, or fissure, not larger, it may be, than a pin's head, may thus become a source of immense mischief and trouble. Or a rough, angular calculus may lodge in the urethra, and tear the mucous membrane, either as it is forced along by the pressure of the urine, or during an attempt at manual extrusion. Or a false route may be made with a bougie, sound, or catheter; or the urethra may be perforated by a sharp, narrow-pointed instrument, or it may be lacerated by a fall astride a chair, the bough of a tree, or an iron railing. It is worthy of remark, that when the urethra is opened, to any considerable extent, by external violence, however inflicted, infiltration will be much more likely to result than abscess. It is only, in fact, when the aperture is exceedingly small, or where, if the reverse is the case, it is speedily glazed with lymph, that the one will be apt to be prevented and the other to form.

An abscess of this description is sometimes produced in another way. Pus, for example, is formed in the periurethral connective tissue, and gradually extends inwards until it ultimately causes ulcerative absorption of the lining membrane, followed by an escape of the matter into the canal, and the ingress of a small quantity of urine into the cavity of the abscess. Thus an abscess that is originally simple may be converted into a urinary abscess. A boil, a carbuncle, or an erysipelas, commencing in the skin and subjacent connective texture, may lead to the same effect.

Abscesses exterior to the urethra are liable to form under a variety of circumstances, of which the most important are gonorrhœal inflammation, stricture, and external injury.

There are cases in which this variety of abscess forms without any obvious causes, or without apparently any previous or co-existent lesion of the urethra. This affection is very tardy in its progress, and seems to be occasionally connected with a scrofulous state of the constitution. In this respect it bears a striking resemblance to those abscesses which are sometimes developed around the anus, in the subjects of phthisis.

Urethral abscesses are generally small and circumscribed, not diffused, as in urinary infiltration, properly so called; for in the one case the irritating fluid, under the influence of which they are developed, is bounded, or walled in, by a deposit of plastic material, while in the other it is sent abroad into the connective tissue, and often spreads over an almost incredible extent of surface: depriving lymph, skin, and other structures rapidly of their vitality. In this respect, a urinary abscess may be said to hold the same relation to urinary infiltration that a common boil does to a carbuncle. In the one, the swelling is small, and circumscribed; in the other, it is diffused, the attendant deposit being cacoplastic, and, consequently, incapable of setting limits to the extravasated fluid.

The first evidence of an abscess of this kind is usually a small, deep-seated lump, tender on pressure, hard, distinctly circumscribed, and more or less movable. This gradually increases in bulk, and manifests a disposition to approach the surface, although, in general, six or eight days will elapse before it attains this point. The integument, previously free from discoloration, now assumes an erysipelatous blush, and often pits slightly on pressure; the pain and tension steadily augment; the structures around feel stiff and uncomfortable; throbbing takes place; the urine is passed with unusual difficulty, from mechanical compression of the urethra; and the patient is seized with shivering, alternating with flushes of heat. In this stage of the affection, the skin is hot and dry, the tongue is brown, the pulse is faltering, the thirst is intense, and there is excessive restlessness with a tendency to delirium. In the worst variety of the lesion, the scrotum is œdematous, the perineum bulges out in the form of a large tumor, the parts around the anus are swollen and tender,

defecation is painful, micturition is difficult, if not impracticable, and the patient is unable to walk about, or even to sit or stand. The contents of a urinary abscess are generally thin, dark-colored, acrid, and more or less fetid. The pus, which contains comparatively few corpuscles, is usually intermixed with lymph, urine, and the débris of the affected parts.

There is a form of this affection in which the symptoms are of a milder character, and which is almost entitled to the appellation of chronic. I have seen it more commonly in persons of a debilitated frame, with a tendency to tubercular disease of the lungs or other parts of the body. The swelling, in such cases, is remarkably tardy, and is seldom larger than a pigeon's egg or a common marble. It is rarely attended, at least for the first week or ten days, by any pain, and there is but little discoloration of the skin. If left to itself, from twelve to eighteen days will elapse before it will break and discharge its thick and ill-elaborated contents.

The diagnosis of this disease is not always so easy as might, at first sight, be supposed. Its character may be suspected when a tumor, small, hard, circumscribed, and almost indolent, forms deeply in the perineum, or along the middle of the scrotum, in connection with stricture of the urethra, chronic gonorrhœa, or disease of the neck of the bladder; when its progress is unusually tardy, when it gradually approaches the surface, and when the skin, previously to giving way, is of a red, erysipelatous aspect. In the acute variety of the lesion, in which the symptoms are of a bolder character, the local affection is generally accompanied, especially after the first five or six days, by excessive constitutional disturbance, a feeble, faltering pulse, rigors, restlessness, and typhomania. In the traumatic form, a strict inquiry into the history of the case, particularly as to the manner of its occurrence, with a careful examination of the part, will usually enable us to arrive at a correct conclusion. After all, however, the matter is not one of much moment, in a practical sense, for in all doubtful cases, attended with local swelling and difficulty of micturition, the treatment is the same.

Whatever may be the size, situation, progress, or real character of an abscess of the urethra, it is always necessarily followed by a fistule, through which the urine is afterwards discharged, either partly or wholly, much to the discomfort and inconvenience of

the patient. The disease, therefore, although seldom dangerous to life, is always to be dreaded on account of this circumstance, which is so much the more unfortunate, because it does not always admit of relief by treatment.

The treatment of urinary abscess is sufficiently simple. The antiphlogistic regimen, rest, recumbency, leeching, and fomentation, will limit the morbid action; and an early external incision will prevent the diffusion of the matter and the urine. If stricture be present, it is removed in the ordinary manner. When the sac has been emptied, and the accompanying inflammation has, in a great measure, disappeared, a catheter should be retained in the bladder, to prevent the escape of its contents by the abnormal orifices, the edges of which are to be touched, from time to time, with nitrate of silver, to promote cicatrization. If the parts around the aperture remain hard and callous, they should be pencilled, once a day, with tincture of iodine, or well rubbed with camphorated mercurial ointment, to stimulate the absorbents, and hasten the removal of effused fluids.

CHAPTER VIII.

FISTULE OF THE URETHRA.

A FISTULE is an accidental track, narrow, straight, or tortuous, lined by an adventitious membrane, and communicating, on the one hand, with the urethra, and, on the other, with the cutaneous surface. Its most common site is that portion of the canal which corresponds with the perineum, and the scrotum; the disease sometimes occurs farther back, and occasionally it exists near the anterior orifice. A rare form of fistule sometimes supervenes upon the operation of lithotomy, the abnormal channel extending from the urethra to the rectum.

The abnormal tracks vary much in extent. Those which occur in the spongy portion of the urethra are always very short, while those which implicate the membranous and bulbous parts are sometimes remarkably long and sinuous. Cases have been witnessed in which they have passed down the thigh, backwards towards the anus, outwards towards the nates, inwards towards the pelvis, or upwards into the groin and the hypogastric region.

Every fistule of this kind has two openings, of which the internal one is usually single, however numerous may be the branches of the abnormal track, or however riddled the cutaneous surface. In some cases, two, three, and even four orifices exist in the urethra; but this is very rare, and always constitutes a serious impediment to a permanent cure. The internal opening is generally of an irregular shape, and varies in size between the smallest pin's head and the end of the little finger.

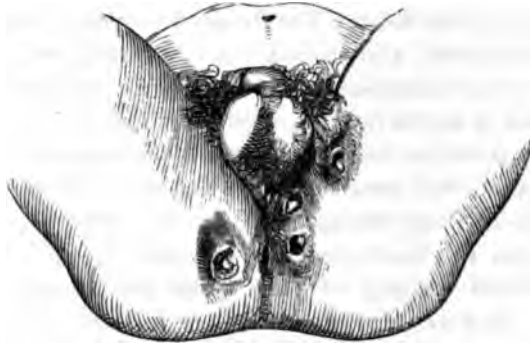
The number of external openings, fig. 156, varies in different cases. Generally speaking, there is but one, or, at most, two or three. I have never seen more than five. Ledran¹ met with an instance of thirty; and Civiale² refers to one of fifty-two. When the number is considerable, the affected surface presents

¹ *Traité des Opérations de Chirurgie*, p. 368.

² *Traité sur les Maladies des Organes Génito-Urinaires*, Premier partie, p. 393.

a riddled, sieve-like aspect. No regularity prevails in regard to the form and size of the external apertures. They may be circular, triangular, or ovoidal, or they may have the appearance of a slit, rent, or fissure; and in their dimensions they may be

Fig. 156.



Fistule of the Urethra.

so small, on the one hand, as to be hardly visible, and so large, on the other, as to admit the end of a probe, a grooved director, or a goose-quill. The situation of the external orifice is usually indicated by the presence of a red, fleshy papilla, which projects slightly beyond the level of the surrounding surface, and is constantly bathed with purulent matter, or pus and urine. Occasionally the opening has a sort of valve-like arrangement.

The abnormal track may be straight or sinuous, single or multiple. If a probe be introduced into the external orifice, it may pass on towards the urethra in a direct line, and this generally happens when the disease occupies the spongy portion of the urethra; on the other hand, the passage is frequently remarkably tortuous, especially if it be long, or situated in the perineum or scrotum. In most cases, there is at first only one track, but as this is liable to obstruction, fresh inflammation is excited, a new abscess forms, and in this way another channel is added to the previous one. Thus, the original track possesses a sort of multiplying power, which is often employed to the great detriment both of the part and of the system.

The abnormal channel is originally nothing but a sinus, or tubular ulcer, which soon becomes covered by granulations, and ultimately by an adventitious membrane, which in cases of long

standing, generally acquires a dense, fibrous character. The fluid furnished by the new passage is generally thin and gleety, and mingled with the natural secretions or excretions of the urethra. When the lining membrane is inflamed or irritated, it is sometimes entirely suspended, or of a bloody, sanious, purulent, or a mucopurulent character. The quantity of urine flowing along it varies from a few drops to several ounces in the twenty-four hours; and cases are not wanting, especially when the fistule is a consequence of impermeable stricture, in which all the water is discharged through it. The abnormal passage occasionally contains one or more calculous concretions, from the volume of a mustard seed to that of a cherry or hazelnut. They are developed in the passage, or they are conveyed into it accidentally from the bladder or the prostate gland. The parts in the immediate vicinity of the fistule are variously affected. Sometimes they are almost natural, or the changes which they have undergone are so slight that it is difficult to detect them; most generally, however, they are considerably swollen, very much indurated, chafed, excoriated, and exquisitely sensitive. If cut, they offer more or less resistance to the knife, and emit a peculiar grating noise. When the irritation has been very protracted, and the patient's health long deranged, they sometimes become the seat of carcinomatous degeneration. It is not often that the periosteum and the bones suffer in this disease, since their deep situation is generally an effectual protection against the contact of the urine.

The immediate cause of this affection is the destruction of the mucous membrane, produced by ulceration, abscess, gangrene, or laceration, and followed by an escape of urine into the connective tissue. Here, acting as a powerful irritant, the fluid speedily excites inflammation, which soon terminates in suppuration, or, it may be, in the death of the affected parts. When the matter is evacuated, or the slough detached, the urine, being no longer pent up, issues at the accidental opening, which now constitutes, in the legitimate sense of the term, a fistule.

The efficient causes of urethral fistule are various. The most frequent, undoubtedly, is stricture, attended with dilatation of the canal behind the seat of the obstruction; but it may also result from ill-managed attempts to pass instruments, or from the protracted sojourn of catheters and bougies, from gonorrhœa,

retention of urine, external violence, shot wounds, and the operation of lithotomy. I have several times seen the urethra become fistulous in consequence of chancre, situated either within the canal, and extending outwards, or commencing on the surface of the penis, and proceeding inwardly. Occasionally, the disease originates in obstruction of the canal by a urinary calculus. The mucous membrane behind the obstacle is gradually dilated and attenuated, and finally takes on ulceration, which, advancing to the deeper structures, leads to an escape of urine, and the formation of an abscess. The opening left by the evacuation of the matter remains fistulous, and affords vent to the urine. The same train of phenomena takes place in stricture. The mucous membrane posterior to the obstruction, being constantly fretted and irritated by the presence of the urine, ultimately gives way, and the disease in question is the speedy consequence.

A person affected with urethral fistule is to be regarded as an object of the deepest sympathy and commiseration. Although he may be able to retain his urine for a considerable interval, or, perhaps, even the usual period, yet whenever he attempts to void it, a certain quantity always escapes at the abnormal channel, wetting his clothes, and irritating the skin of the perineum, the scrotum, and the thighs. When the opening is situated far back, there may be an incessant dribbling, and, in such a case, no care can secure his comfort, or protect him from the offensive smell which exhales from him wherever he goes. The parts in the immediate vicinity of the fistule are constantly sore, swollen, excoriated, and subject to new attacks of inflammation, which are often followed by new abscesses and new tracks. In the more severe forms of the complaint, the patient finds it difficult, if not impossible, to move about, or take his accustomed exercise; the bladder becomes irritable, and intolerant of its contents; the calls to micturition increase in frequency; the urine is loaded with mucus, and exhales a disagreeable, ammoniacal odor; the general health declines; the appetite fails; the body wastes; and the poor sufferer, abandoned to despair and wretchedness, hails death as a welcome messenger.

The diagnosis of this disease is usually easy. An opening exists in some portion or other of the urethra, giving vent to urine either in drops, in jets, or in a continuous stream, synchronous with the act of micturition. The quantity of fluid evacuated by the

natural route usually varies with the character and degree of the obstruction upon which the fistule depends. In some instances, nearly the whole passes off by the accidental passage; in others, only a few drops or teaspoonsful. When the track is situated in the membranous or prostatic portion of the canal, the urine may dribble away constantly; but this is rare. A probe, of small size, introduced into the external orifice, readily enters the urethra, provided the abnormal passage is not very narrow, oblique, angular, or sinuous. When this is the case, it may be difficult, if not impossible, to effect the object, however adroitly or perseveringly the operation may be conducted.

In regard to their prognosis, it may be observed that urethral fistules are, in general, a source of inconvenience rather than of danger. When the disease is of an aggravated character, and is complicated with an intractable stricture, life may gradually be destroyed by constitutional irritation, or by local suffering from disease of the bladder, the prostate gland, or the kidneys. In simple fistule no such result is to be apprehended. The case, if well managed, is productive of little trouble, and is readily relieved by treatment. When the affection is accompanied by great loss of substance, or when it involves the posterior and more deeply-seated portions of the canal, it may be incurable, and render the patient miserable for life. A fistule of the urethra has sometimes been followed by impotence, not from a want of erection or ability to copulate, but on account of the escape of the greater part of the spermatic fluid by the accidental route.

The treatment, although obvious, is not always easy. The first thing to be done is to seek for, and, if possible, to remove, the exciting cause. In most cases this will be found to be a stricture, probably of long standing, upon the division of which, and the restoration of the urethra to its natural calibre, the abnormal track ordinarily closes of its own accord. To prevent the contact of the urine with the internal opening of the fistule, the patient should be taught to empty his bladder at stated intervals with the soft, bulbous catheter. Conducted upon these principles this mode of treatment rarely fails in the more mild and uncomplicated form of the malady. It sometimes, however, happens, after all obstruction in the urethra has been removed, that the fistule manifests no disposition to heal, but remains

pervious to the urine. Several causes may give rise to this occurrence. In the first place, it may be owing to the presence of a calcareous concretion, which, as was previously stated, sometimes forms in a passage of this kind, and prevents it from closing. The proper remedy, of course, in such a case, is to remove the foreign body, for as long as it remains no progress towards a cure can be expected. The extraction may be effected either with the forceps alone, as when the passage is very spacious; or with the forceps and knife when it is narrow, or small and sinuous. Secondly, the indisposition to unite may depend upon the presence of an abnormal pouch, or upon an unusually large internal orifice. In either case, the proper remedy is a free incision, so as to enable the parts to heal from the bottom. Thirdly, the occurrence may be owing to the peculiar nature of the lining membrane of the accidental track, which may be of a firm, almost semicartilaginous consistence, and be constantly bathed, on its free surface, with a thin, glairy mucus, thus preventing the opposite sides from adhering. When this is the case, the object should be to destroy the secreting surface, and to promote the granulating process, by means of stimulants or escharotics. One of the best remedies for accomplishing this end is the nitrate of silver, which may be used either in substance, as when the fistule is very shallow, or in the form of a tolerably strong solution, carefully introduced with a small ivory syringe or a common probe. Forty grains of the salt to the ounce of water is the proportion which I usually employ, and I seldom repeat the application oftener than once every forty-eight hours. Sometimes I have used with advantage a piece of sulphate of copper, cut to a delicate point, and retained for ten or twelve seconds in the abnormal passage. In obstinate cases, recourse may be had to the occasional introduction of a heated wire, or to a probe dipped in nitric acid, a concentrated solution of lunar caustic, or the acid nitrate of mercury. Too much caution, however, cannot be observed in the use of these and similar remedies, which are well calculated, if applied too freely, to cause severe inflammation and even sloughing. The object, in all cases, should simply be to destroy the lining membrane, without involving any of the surrounding tissues. Any tendency to premature closure of the external orifice is

prevented by touching its margins, every few days, with caustic potassa, or some other escharotic substance.

When the fistule is obstinate and protracted; when its internal orifice is uncommonly large, or when there are several openings of this kind; or, finally, when it depends upon an old stricture so firm, narrow, and extensive, that it cannot be destroyed in the ordinary manner, the only course left is to lay the parts open by an external incision; a procedure which often remarkably expedites the cure of both affections.

When the fistule involves the spongy portion of the urethra, and has been caused by chancre, or external injury, attended with loss of substance, it may be necessary to have recourse to suture, as the more ordinary means not infrequently fail, in consequence of the difficulty with which the accidental opening cicatrizes in this situation. The suture usually employed is the twisted, made with very short, slender needles, placed not more than a line and a half apart. A medium-sized catheter having been previously introduced into the bladder, the edges of the opening are carefully pared, as in hare-lip, and then nicely approximated, the ends of the ligatures being passed from one needle to the other, the points of which are next cut off with the forceps. Instead of this suture, some surgeons recommend the interrupted, which, however, does not possess any advantages. Dieffenbach suggested the plan of running the suture round the fistulous orifice, after the fashion of a purse-string, the epidermis, loosened by the application of tincture of cantharides to the margin of the opening and the surrounding skin, having previously been scraped away. When the thread is tightened, it draws the skin into puckers, and approximates the edges of the aperture so completely as to enable them occasionally to unite by the first intention. Several cases in which this treatment has been successfully employed have been published by Dieffenbach and other surgeons.

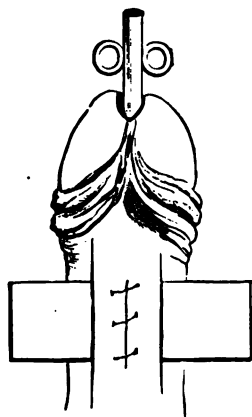
The principal objection to the employment of the suture, in any form, for the relief of this affection, is its liability to tear itself out before the completion of the adhesive process, in consequence of the morbid erections which are so apt to take place after the operation. It is this occurrence which so frequently mars the result of our efforts, and renders it necessary to repeat them. To guard against these erections, which often become

troublesome within the first few hours after the operation, recourse should be had to anodyne enemata, or suppositories of opium and camphor, and to the application of pounded ice to the perineum and hypogastrium.

Excision has sometimes been practised with advantage. When the parts in which the stricture is situated are unusually callous and circumscribed, an elliptical portion, embracing the external orifice, is cut out, and the raw surfaces are approximated by suture over a silver catheter, previously introduced into the bladder.

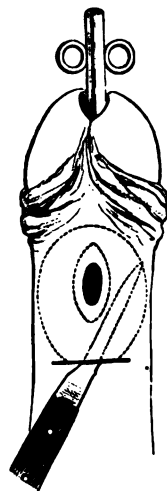
When the fistule is attended with considerable loss of substance, urethroplasty may become necessary. This term is employed to designate a process which has for its object the restoration, by the transplantation of a piece of healthy integument, of a part of the urethra that has been lost, either partially or wholly, by accident or disease. The operation, which requires no little skill for its successful issue, is chiefly applicable to fistules opening into the spongy portion of the canal. Different modes of urethroplasty have been devised, each of which possesses, perhaps, certain advantages in particular cases; none of them,

Fig. 157.



Dieffenbach's Method of Urethroplasty.

Fig. 158.



Nélaton's Method of Urethroplasty,

however, are very certain in their results, and hence it is a good rule never to resort to them as long as there is any prospect of affording relief by other means.

One of the most simple of these processes is that of Dieffenbach, represented in fig. 157, which consists in paring the raw edges of the opening over a catheter, previously introduced into the bladder, so as to form a crescentic cleft, the long diameter of which corresponds with that of the penis. A longitudinal incision is then made on each side of the cleft, when the intervening integuments are raised in two bridge-like flaps, and united closely at the middle line by numerous points of the interrupted suture, over a piece of India rubber, or strip of thin lead, with the view of preventing contact of the urine. In Nélaton's operation, which is one of the most successful, after refreshing the edges of the fistule, the surrounding integuments are dissected up subcutaneously in the manner represented in fig. 158, through which the edges of the abnormal opening are easily approximated by a few points of suture.

Alliot, anxious to avoid the inconveniences which so frequently result from the contact of the urine with the raw edges, circumscribes and dissects a small square flap on one side of the accidental channel, and removing from the other side a portion of skin equal to the flap, covers the opening and the loss of substance with the latter, which is securely fastened by the twisted suture. In this way the line of union is carried out of the way of the urine as it passes through the urethra. This ingenious process seems to have been completely successful in the hands of its inventor.



Urethroplasty by
Scrotal Flap.

The Indian method, as it is called, fig. 159, is performed by closing the gap by borrowing integuments from the neighboring parts, as the scrotum, penis, or the groin. The callous edges of the opening are previously very freely pared so as to produce a large new surface, when a portion of sound skin is dissected up, except at one point, and inserted into the wound, to which it is loosely fitted and secured by suture. This method is the only one that is at all likely to eventuate in success, when a large portion of the urethra has been destroyed.

In this, as well as in all operations which have for their object

the closure of a fistule, or the restoration of a portion of the urethra, I conceive it to be a matter of paramount importance to divert the urine into some other channel until adhesion is accomplished. The operation has been sanctioned by high authority, and has been employed successfully in several instances. In a case treated by Ricord, with whom the suggestion originated, the opening was situated anterior to the scrotum, in the spongy portion of the urethra; in which, from the great thinness and mobility of the tissues, it is almost impossible to secure thorough closure. He made an incision into the membranous urethra, and kept it open for the passage of the whole of the urine until the accidental track was completely united, when it was permitted to close. The patient had been previously subjected to various methods without the slightest benefit.

CHAPTER IX.

PROLAPSE OF THE MUCOUS MEMBRANE OF THE URETHRA.

THE mucous membrane of the urethra, like that of the bladder, with which it is continuous, is liable to become inverted and prolapsed at the external orifice of that canal. The affection is extremely rare, and is, for obvious reasons, confined to the female sex. It is chiefly met with in children, in consequence of repeated and long-continued efforts at straining, and is characterized by the existence of a tumor which is generally of a cylindrical, rounded, or globular shape, soft in consistence, of a reddish or purple hue, and entirely free from pain and soreness, except when it has been chafed, irritated, or inflamed. Its precise situation is towards the superior part of the vulva, between the pudendal lips, where it may be seen projecting from the orifice of the urethra, which is itself usually considerably dilated, for the more ready extension of the investing membrane of which it is composed. The centre of the tumor always contains a distinct opening, corresponding to the external meatus of the canal, and large enough to admit the passage of a medium-sized catheter. It varies in size from a pea to a pullet's egg, and as the protrusion advances, the investing membrane becomes hypertrophied, preternaturally red, and beset with enlarged and varicose veins, and the urethra is proportionately dilated for the reception and passage of the affected structures.

It is, in general, sufficiently easy to distinguish between this affection and inversion and prolapse of the bladder, described elsewhere. The most important diagnostic signs are that in the former, the tumor is usually much smaller than in the latter, that it is more cylindrical or slender in its figure, that it is not liable to be attended with incontinence of urine, and that it does not receive any distinct impulse when the patient coughs, laughs, or sneezes. When the tumor is formed by the inverted bladder, we are generally able to detect the orifices of the ureters, while in the disease under consideration there is, of

course, no such appearance. It is readily distinguished from polyp, by its non-pedunculated appearance, and by the fact that it forms a distinct ring around the orifice of the urethra.

In the treatment of this disease, special attention is to be paid to the manner of voiding the urine. Instead of observing the usual posture, the patient should lie on her side or back, lest the tumor be forced down before the stream, and thus, by the frequent repetition of the act, be permitted gradually to augment in volume. When the protrusion has already made considerable progress a cure will hardly be possible without the constant use of the catheter and the aid of astringent lotions and injections. The general health, if impaired, should be amended by tonics and other means calculated to invigorate the system, and impart strength to the affected structures. Recumbency, long continued and steadily persisted in, will, in nearly all instances, be an indispensable adjuvant. When the disease is obstinate, or has resisted the more ordinary remedies, excision, ligation, or the application of strong nitric acid, may become necessary.

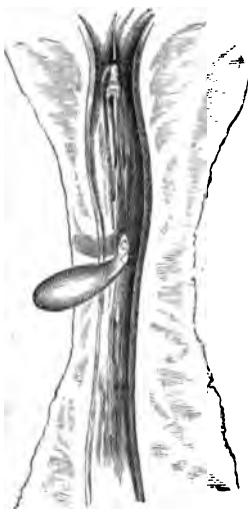
CHAPTER X.

TUMORS OF THE URETHRA.

NEOPLASMS of the urethra are of infrequent occurrence. As a primary affection, the only ones met with are the fibrous, either as polypoid or papillary growths, and the vascular. Carcinoma is always the result of extension of the disease from the bladder, prostate, or gland of the penis. The fibrous and vascular growths are more common in the female than in the male, and nearly always originate in the posterior wall of the canal.

a. Polypoid fibroma, or polyp, usually springs from the navicular fossa of the male; sometimes, and particularly in elderly subjects, it is situated farther back, as in the case recorded by

Fig. 160.



Polypoid Fibroma of Urethra.

Sir Henry Thompson,¹ and represented in fig. 160, in which a growth of this nature, about nine lines long by three in width, was found at the junction of the membranous and prostatic portions of the canal. In women, they are also generally situated near the external meatus, so that during their progress, they not unfrequently project beyond the pudenda. In rare instances, they occupy the posterior part of the urethra, and may then pass into the bladder, or, as in a case recorded by Dr. W. H. Williams,² of Louisiana, separate the vulva. The growth, which was larger than a hen's egg, and attached by a double pedicle near the inner meatus, had distended the urethra, so that it readily admitted of the passage of three fingers.

In the male, the number of these tumors varies from one to three or four; frequently, they are solitary. In their volume

¹ *Op. cit.*, p. 87.

² *Buffalo Medical and Surgical Journal*, April, 1869.

they range between the smallest pin's head, and an ordinary bean. Their shape is irregular; pyriform, conical, or spheroidal. They are of a reddish complexion, compressible and elastic in their consistence, while their surface is sometimes perfectly uniform and smooth, and, at other times, granulated, or lobulated. When minutely examined, they are found to consist of a succulent, delicate fibrous tissue, which is rarely well provided with bloodvessels, and to be invested by a prolongation of the lining membrane of the urethra.

Polypoid fibroma is generally free from pain, in which respect it differs, and that remarkably, from the vascular growths described below. They rarely advance beyond the size above mentioned, are usually unattended by mucous or purulent discharge, and seldom materially obstruct micturition. In the female, however, it may not only attain the volume of an egg, and give rise to constant incontinence of urine and great impairment of the general health, as in the case of Dr. Williams, but it may even acquire the bulk of a large fist. In an instance of this nature, occurring in a woman of forty-one, who suffered from dysuria and constipation, a soft fibroid, weighing three pounds, and projecting from the genitals through the meatus, which was an inch long, was removed by Dr. Höning.¹

Fibrous polyps are tardy and insidious in their development, and when deeply seated, they may exist for many years, without the possibility of detection. As they are generally very soft, they are liable to be pressed to one side by the passage of a solid instrument, so that the exploratory bulbous bougie affords the only means of establishing the diagnosis when they are of small bulk and deeply seated.

The removal of these excrescences is best affected by excision with the scissors, the wound being touched immediately afterwards with chromic acid, nitrate of silver, or sulphate of copper, with the view to prevent repullulation. In the event of hemorrhage, the raw surface may be seared with the hot iron; or a bit of lint, wrung out of Monsel's solution, may be firmly pressed upon it, until the blood entangled in its meshes has coagulated. When such a tumor is deeply seated, it may be torn away by the

¹ Biennial Retrospect for 1869-70, p. 372.

urethral forceps, or by the ingenious procedure of Dr. Ebermann.¹ This consists in introducing an endoscopic tube, the end of which is closed, and entangling the growth in its large oval eye, when a second tube, the extremity of which is open and sharp, is passed into the former, and the polyp cut away. On withdrawing the latter tube, the wound is cauterized with nitrate of silver. When the growth is located far back, and of large bulk, an incision may have to be made down upon it, through the spongy body of the urethra.

β. Papillary, or villous fibroma, or papilloma, occasionally occurs in the male urethra as a result of inflammation of its mucous membrane. In one instance, that of a young man, of twenty-four, who was under my charge some years ago, the tumor, which was situated just behind the urinary meatus, and of the size of a hemp-seed, was evidently of a gonorrhœal origin.² Their number seldom exceeds half-a-dozen, although they may stud the mucous membrane of the urethra from one extremity to the other. In a very remarkable case recorded by Roger,³ the vegetations, which formed dendritic, club-shaped villousities, from the size of a pin's head to that of a pea, reached from the bulb to the meatus, greatly distending the urethra, which measured two inches and two-fifths in circumference at the level of the bulb. The walls of the canal were greatly thickened and indurated. The patient had always suffered from dysuria, which amounted to retention for twenty-four hours before his death from phthisis, and the enlarged and lengthened penis was always in a state of semierection.

Papilloma usually presents itself as a congeries of long, filamentous, dendritic villi, forming a mass which varies in size from a pin's head to that of an egg. Occasionally, it resembles an acuminate lobular condyloma, its surface presenting a cauliflower appearance, and being attached by a broad base, as in fig. 161, from Lambl.⁴ The growth, which was excised without any hemorrhage, from the urethra of a young girl by Professor Seyfert, was of fourteen years' duration, and had occasioned no

¹ St. Petersburger Medicin. Zeitschrift, Bd. viii., 1865, p. 252.

² In a case under the care of the editor, a similar growth sprung from the cicatrice left by the division of a stricture, a quarter of an inch behind the meatus.

³ Gazette Hebdom., No. 32, 1860, p. 555.

⁴ Prajer Vierteljahrsschrift, Bd. I., 1856, p. 21.

urgent symptoms except some difficulty in micturition. It was as large as a small egg, and each papilla was composed of a beautiful network of bloodvessels, held together by delicate

Fig. 161.



Papilloma of Urethra.

connective tissue, and invested by polygonal tessellated epithelial cells, which is the ordinary histological construction of these tumors.

The symptoms and treatment of this form of fibrous growth do not differ from those of polypoid fibroma.

γ. Vascular Tumors.—This variety of morbid growth of the urethra is generally denominated the “vascular tumor,” “vascular polyp,” “vascular excrescence,” or “caruncle.” It is very different in its structure from the preceding, and is in great measure, if not entirely, peculiar to the female, being usually situated just within the margin of the urinary meatus, or in the anterior portion of the canal. In some instances, however, it lies farther back, and may then project slightly into the bladder. Cases also occur in which it occupies the parts immediately around the urinary meatus. Occasionally, although rarely, the excrescences are found simultaneously in all these situations.

The vascular polyp of the urethra is of a bright florid color, exquisitely sensitive, and of a conical, ovoidal, or rounded form. In its volume it varies from that of a large pin’s head to that of a currant, a pea, or a cherry, which latter it rarely exceeds. Its attachment is generally by a tolerably broad base, but in many cases, especially when it is pyriform, it adheres by a narrow pedicle. In number, it varies from one to ten or fifteen, although, in general, it does not exceed three or four. Frequently, in fact, it is solitary. When several exist, they are

either isolated, or grouped together. In its structure, this variety of tumor is essentially vascular, and hence it frequently bleeds upon the slightest touch. Minutely examined, it is found to consist of a congeries of minute vessels, arterial and venous, which are held together by delicate mucous or connective tissue, and invested by pavement epithelium. From the exquisite pain of which it is the seat, it is evident that it must also be well supplied with nerves, although it is not easy to demonstrate their existence. Thus constituted, it is of a soft, spongy consistence, and of an erectile character, with a smooth and florid surface.

Considerable diversity obtains in regard to the appearance of these tumors, depending, probably, not so much upon any peculiarity in their organization, as upon their age and the degree of irritation to which they are subjected. Thus, instead of being of a bright red, scarlet color, they are sometimes quite pale, grayish, spotted, or purple. Their surface is occasionally fissured, obulated, or rough and granulated, like a raspberry, or studded with small villousities. Their sensibility, although generally exquisite, is sometimes very slight, or almost null.

The growth of these excrescences is usually tardy. After they have attained a certain volume, they frequently advance in an imperceptible manner, or remain stationary altogether. Their origin is commonly insidious, and hence a considerable period often elapses before the patient is rendered aware of their existence, or before their true nature is suspected by the practitioner. Of their causes nothing whatever is known. They seem to be developed in the submucous connective tissue, and, as already stated, they never attain a larger bulk than a cherry or a pigeon's egg, whatever may be their age or situation. They are not confined to any particular period of life, but are most common in married females, after the age of thirty-five or forty. They rarely, if ever, occur before the time of puberty. I have met with them, in one instance, in a girl of seventeen, and, in another, in a married woman of sixty-three.

The characteristic features of these tumors are, their florid complexion, their exquisite sensibility, their insidious origin, their slow development, and their small size. The suffering which attends them is often so great as to render the patient utterly miserable, and unfit for the ordinary duties of life. It is much increased by walking, the erect posture, sexual inter-

course, micturition, and even the contact of the dress. The slightest touch, indeed, is commonly intolerable. The pain, which is frequently of a sharp, shooting character, extends, in many cases, into the pelvis, up the back, and down the thighs. From the situation of the morbid growths, micturition is mechanically obstructed; the stream of urine is sometimes reduced to the size of the smallest thread, and the evacuation of the fluid is accompanied with a hot, scalding sensation, severe pain, great straining, and, occasionally, slight hemorrhage. The bladder is excessively irritable, and there is almost a constant inclination to void its contents. Occasionally, the symptoms closely simulate those of stone, or carcinoma of the vagina. In the more aggravated forms of the affection, the general health is apt to suffer; symptoms of dyspepsia gradually show themselves; the stomach is weak and flatulent; the bowels are constipated; the urine is high-colored, scanty, and acid; the spirits are depressed; the patient is unable to move about, or take the slightest exercise, and the system is finally worn out by feverish excitement, melancholy, and loss of sleep. Little discharge attends these tumors, except when they are chafed or irritated by exercise, when they are liable to become inflamed, and to pour out a thin mucopurulent fluid.

There is little probability that vascular growths will be confounded with other morbid growths of the female urethra and its external orifice. The tumors for which they are most liable to be mistaken are the verrucous, from which, however, they may, in general, be easily distinguished by their history, the peculiarity of their situation, their florid appearance, their great sensibility, and the obscure nature of their origin. The verrucous excrescence is placed exterior to the urethra, upon the vestibule, is insensible, does not bleed when touched, and is of the same color as the surface from which it grows. It is always accompanied, moreover, by a mucous discharge, and is generally multiple. The polypoid tumor, although occupying the same situation, is easily distinguished from the vascular tumor by its larger size, its want of sensibility, its paler color, and its indisposition to bleed even when rudely touched. Like the vascular excrescence, it may obstruct the flow of urine, but it is never attended with the local and general distress which characterize the other growth. It need hardly be added that no opinion

should ever be given concerning any tumor in this situation without a thorough examination, both tactile and visual.

A case is mentioned, under the head of Inversion of the Bladder, where a tumor, formed by a prolapse of the organ, came very near being mistaken for a vascular growth. It happened in a child between two and three years of age; the swelling was about the size and shape of a walnut, with a rough, granular surface, not unlike that of a large strawberry. The professional attendant proposed to remove it with a ligature, which he was about to apply, when another surgeon, who was called into consultation, fortunately detected the true character of the disease, and thus saved the child's life.

Although these tumors are, in general, not dangerous, yet they may, by the protracted irritation to which they give rise, occasionally destroy life, or reduce the patient to the very verge of the grave. When extirpated, or removed by caustic or ligature, they are apt to return, and to acquire, in a short time, their original volume. Occasionally they assume a malignant tendency, and gradually degenerate into open sores, which manifest no disposition to heal, and which discharge a thin, foul, irritating ichor.

The treatment of this variety of tumor is strictly of a local character. Constitutional remedies, beyond their effect of improving the secretions and imparting tone to the system, are of no benefit. Attempts have been made from time to time to repress this morbid growth by astringent and sorbafacient applications, such as acetate of lead, Goulard's extract, tincture of iodine, and nitrate of silver; but without success. Instead, therefore, of wasting his time in this way, the surgeon should proceed at once to the employment of the only remedy known to be capable of affording permanent relief, namely, excision. This may be accomplished either with the knife or the scissors, according to the situation of the tumor. Seizure is effected with a small double hook, or a pair of broad-bladed forceps; the morbid growth is put gently on the stretch, or, if situated far back, carefully drawn forward, and then pared or snipped off with one stroke of the instrument, close to the mucous surface, or, if possible, so as to include a portion of this. Where this cannot be done, the surgeon waits till the bleeding has ceased, and then touches the cut surface with chromic acid, followed by

a strong solution of carbonate of soda to neutralize that agent. The object of this procedure is to destroy the deep-seated portion of the excrescence, and, by modifying the capillary action of the part, to guard against its reproduction, which is otherwise almost certain to take place.

When the tumor is situated some distance within the urethra, it may become necessary, as a preliminary measure, to dilate the canal in the same manner as when the surgeon wishes to extract a urinary calculus. When the growths are situated at the external meatus, or just within the urethra, and are so numerous as to form a kind of belt or zone around its circumference, the safest plan is to excise the affected portion of the canal, including the mucous membrane and submucous connective tissue, and approximate the edges by sutures. The bleeding which follows the operation, and which is occasionally quite profuse, is readily stanchd by pressure with a tent and compress wet with a strong solution of alum or gallic acid. Retention of urine sometimes ensues, and has to be met with the catheter.

The removal of these tumors is sometimes effected by ligature. The operation is both awkward and painful, and, worse than all, is seldom effectual, a portion of the excrescence being usually left behind, thus favoring repullulation. Should it be preferred, great care should be taken to apply the ligature as closely as possible to the base of the morbid growth, and to draw it with sufficient firmness to insure its speedy strangulation. Detachment usually takes place in three or four days. A practical precaution, of some consequence in using the ligature, is that it should not be too fine or delicate, nor drawn too tightly, otherwise it will cut through the tumor prematurely.

Any reproductive tendency that may manifest itself after these operations, should be counteracted by chromic acid, nitrate of silver, or by a solution of this substance in nitric acid, by the tincture of the chloride of iron, or, what I prefer, by the tincture of iodine.

CHAPTER XI.

FOREIGN BODIES IN THE URETHRA.

THE urethra is liable to the introduction and lodgment of foreign bodies, which differ very much in their character, according to the source from which they are derived. Considered with reference to this point, they may be appropriately arranged under two heads: 1st, those which descend from the urinary bladder, or which are developed in the urinary canal itself; and 2dly, extraneous substances forced into the urethra through its external orifice.

1. Foreign Bodies which descend from the Bladder, or are developed in the Urethra. — Most of the substances which descend into the urethra from the bladder are organic or inorganic concretions, which are developed either in the latter organ, in the prostate, or in the kidneys. Sometimes, however, they consist of articles which were originally admitted through the urethra, and which have afterwards, in consequence of the force impressed upon them by the bladder or the stream of urine, taken a retrograde course. A bean, a bit of catheter, the end of a bougie, a needle, or a piece of wood, has sometimes met with such a fate. A ball, a portion of wadding, or a fragment of bone, accidentally introduced into the bladder, may likewise pass from this organ into the urethra, and become impacted in it.

Secondly, the concretion may be developed in the urethra itself. The occurrence is rare; but that it is possible is shown bit by the fact that a foreign body, such as a piece of straw or a of bougie, lodged in this canal, has sometimes become speedily incrustated with sabulous matter, and that calculi have occasionally formed in a perineal fistule, the scrotum, and the prepuce. The development is favored by the existence of an abnormal pouch of the urethra, or by an organic stricture attended with dilatation and ulceration of the canal behind the obstruction. The concretions do not seem to differ, in any essential particular,

as it respects their physical and chemical properties, from those which form in the bladder and kidneys. They are usually diminutive; and they vary in their number from one to five or six.

A very extraordinary example of calculus of the urethra is mentioned by the late Professor Mütter, in his *Notes to Liston's Operations of Surgery*. The patient was a young man of twenty, of very feeble health, and with evidence of chronic inflammation of the bladder. The concretion, which was immovably fixed in its situation, hard, smooth, and about the diameter of an ordinary pipe-stem, was accurately moulded to the urethra, and reached from within an inch of the external orifice of the canal to the neck of the bladder.

A urinary concretion, or any other foreign body forced from the bladder into the urethra, may lodge in any portion of this canal, from its commencement to its termination, and the symptoms awakened by its presence will not vary essentially whatever may be the part affected. When the substance is permanently fixed, it generally attains a greater magnitude in the membranous division of the canal than in any other, simply because this portion of the canal is naturally very dilatable. Sometimes, however, large concretions form at the prostatic portion, the sinus of the bulb, and the navicular fossa.

The passage of a calculus from the bladder along the urethra is frequently productive of great inconvenience and distress. The intromission is generally sudden and unexpected, taking place while the patient is engaged in micturition. It is instantly followed by an interruption of the stream of urine, an urgent desire to empty the bladder, severe straining, more or less pain, and a sense of burning or tearing in the urethra. If the substance is small, it may be expelled in a few minutes, perhaps during a new effort at micturition followed by immediate and permanent relief. If, on the contrary, it is disproportionately bulky, it may be arrested for several hours or even days, and give rise to severe suffering, accompanied by partial or complete retention of urine, painful erections, and probably also by slight hemorrhage from laceration of the mucous membrane. When the calculus is of extraordinary size, it can hardly fail to lodge permanently, and to lead to all the distress, both

local and constitutional, which is always sure to result from the protracted obstruction of an important excretory tube.

The symptoms which attend the passage of a calculus along the urethra may be simulated by those produced by other causes, and are, therefore, of no positive value in determining the nature of the accident. To establish the diagnosis, it is necessary to institute a careful examination with the finger and the catheter. When the foreign body occupies the spongy portion of the urethra, the finger, applied to the lower surface of the penis, will generally readily detect it, and give the surgeon a correct idea both of its volume and configuration. The same means will enable him to ascertain whether it is fixed or movable. When the substance is situated farther back, as in the membranous or prostatic portion, the exploration must be conducted with the finger in the rectum, otherwise, especially if it be very small, it will be impossible to feel it, on account of the great thickness of the soft parts.

When the foreign body cannot be detected with the finger, or where any doubt remains respecting the real nature of the obstruction, recourse must be had to the catheter. The best instrument, for this purpose, is a silver one, well rounded at the vesical extremity, and of medium size. This is introduced in the usual manner, and carried on towards the bladder as slowly and as gently as possible. If the obstruction has been caused by the presence of a calculus, the contact of the catheter with the foreign body will produce a peculiar sound and a rubbing or grating sensation, which no one, practised in such examinations, can mistake. The diagnosis is established. Some idea may be obtained concerning the volume of the concretion by observing whether the instrument is completely arrested by it, or whether it slips between it and the walls of the urethra. In making this exploration, care should be taken, by inserting the finger into the rectum, that the foreign substance be not pushed back into the bladder; an occurrence always to be deprecated, unless it is rendered absolutely necessary in consequence of retention of urine, or the want of proper instruments for performing extraction. It is worthy of remark, that, when the calculus has escaped from the urethra and lodged in the subjacent structures, the instrument may fail to detect it, even when it is of large size.

When a calculous concretion has been developed in the urethra,

or has been forced into it from the bladder and retained there for a long time, its tendency is to increase, by the addition of new deposits from the earthy salts of the urine. The extent to which this augmentation may reach is variable, as are also the effects to which it may lead, as it respects the surrounding tissues. A concretion, weighing five or six ounces, has occasionally been developed in this situation, and given rise to all the symptoms of vesical calculus. Long before it attains such a bulk, the foreign substance, producing ulcerative absorption, leaves the canal of the urethra, and forms a sort of cul-de-sac by the expansion, thickening, and condensation of the circumjacent structures.

A calculus, permanently impacted in the neck of the bladder, has been known to cause complete absorption of the prostate gland, and great dilatation of the corresponding portion of the urethra. The foreign body, in this case, being situated partly in the bladder and partly in the urethra, sometimes attains an extraordinary volume, and presents a most bizarre appearance, especially when it extends several inches into the latter canal. The symptoms are those of ordinary vesical calculus, except that there is not so much interruption to the stream of urine, because of the immovable condition of the concretion, and because of there being also, for the same reason, more frequently incontinence, in consequence of the loss of power of the sphincter muscle.

Finally, a calculus, after having remained in the urethra for an indefinite period, sometimes effects its own expulsion. This it does by exciting absorption of the surrounding parts, which gradually progresses until all the tissues give way, save, perhaps, the cutaneous, which at length yields under a violent effort at micturition. Or, instead of this, the skin ulcerates at the most prominent portion of the tumor, and exposes the foreign body to such an extent as that it may be easily extracted.

The treatment of urethral calculi must necessarily be influenced by a variety of circumstances, some of which hardly admit of precise detail. When the foreign body is lodged in the posterior portion of the canal, behind the triangular ligament, and is so large as to obstruct the flow of urine, the safest plan is to push it back into the bladder, whence it came. For this purpose a full-sized silver catheter, with a small curve, open at the

extremity, and provided with an obturator, and resembling the instrument represented at page 116, is used; this is introduced in the usual manner, when the obturator is removed, and the open beak then gently but firmly pressed against the concretion, at the same time that the finger is applied upon the perineum, to prevent the formation of a false passage. A small instrument is unsuitable, inasmuch as its point might pass between the calculus and the wall of the urethra. Any spasmodic action that may exist, whether in the canal itself, or in the muscles by which it is surrounded, should be combated by chloroform. Unless the concretion is very bulky, rough, or curved, this plan will seldom fail, and should always, I conceive, be preferred to the more uncertain method of extraction.

If, on the contrary, the extraneous body is comparatively small, or so irregular on the surface as to enable the patient to void his urine, it should not be pushed back but removed. Delay here is of little consequence, as the accident is rarely attended with much suffering, and the surgeon has ample time to prepare for the operation. Before resorting to extraction, an attempt should be made to favor the expulsion of the concretion, by dilating the portion of the urethra which is in front of it, by means of the catheter or bougie. This process has been successful in more instances than one. Occasionally extrusion may be effected by injections of sweet oil, or by closing the meatus, and holding it tightly while the patient is making a powerful effort to expel his urine, at the same time that pressure is applied along the under surface of the urethra, to urge on the foreign body.

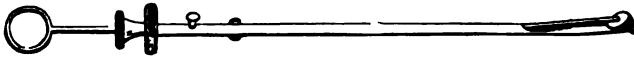
When the calculus occupies the spongy portion of the canal, it should be extracted, whatever may be its size or form. To push it back into the bladder would be difficult and hazardous, on account of the distance at which it is situated, and the curved direction of the urethra, to say nothing of the violent spasm which such an attempt is calculated to awaken in the perineal muscles.

When the foreign body, whatever be its situation, is so firmly impacted that it can neither be expelled by the powers of the patient, nor pushed back into the bladder, extraction is necessary. This may generally be effected when the concretion is near the orifice of the urethra, or in that portion of it which

corresponds with the head of the penis, by very simple means, as a pair of narrow-bladed dissecting forceps, or even the fingers; but the reverse is often the case when it is lodged far back in the canal. One of the most simple contrivances for effecting our object, under such circumstances, is the wire-loop, originally suggested by Marini. This consists, as the name implies, of a piece of smooth, thin, flexible wire, of silver or copper, bent like a hair-pin, the convex extremity of which is passed down the urethra, and insinuated behind the foreign body, which is then caught and drawn out. A modification of this instrument, if so it deserves to be styled, was made by Jules Cloquet, by adapting to it a silver canula with a side-screw, in order the more effectually to secure the calculus after it has been seized by the wire. The objection to this instrument, in both its forms, is the difficulty of passing it behind the concretion, which, when large enough to lodge, usually fills up the entire passage.

When these simple means fail, and also in the more difficult forms of the accident, recourse must be had to the urethral forceps, of which there is a great variety. Several of these instruments are represented in the annexed drawings, which preclude

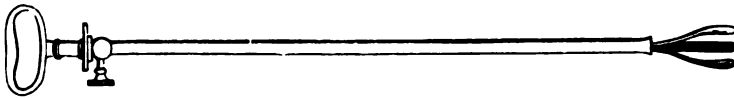
Fig. 162.



Articulated Scoop of Bonnet.

the necessity of any labored description. The one to which I give the preference, both on account of its simplicity and its happy adaptation to the end proposed, is the articulated scoop of Bonnet, of Lyons; it is armed with a stylet, and is furnished with a head for seizing and fixing the foreign body. The instrument, well oiled, is introduced shut, until it comes in contact

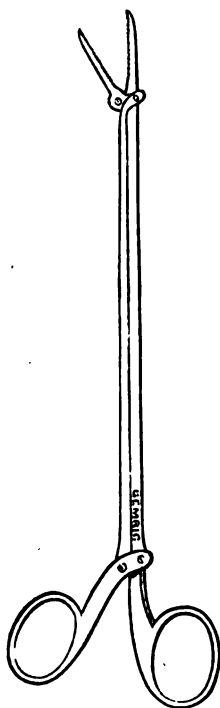
Fig. 163.



Hunter's Forceps.

with the concretion, when its blades are expanded over it; the extraction being effected in the most slow and gentle manner,

Fig. 164.



Mathieu's Forceps.

to prevent injury of the mucous membrane. Fig. 163 represents Hunter's forceps, as improved by modern surgeons. Mathieu's instrument, fig. 164, is probably the best of its class.

Breaking or crushing is applicable only when the calculus is soft or friable; but as this can hardly ever be known beforehand, it is seldom available. The operation, moreover, is seldom safe, however carefully performed, being liable to be followed by laceration of the mucous membrane, infiltration of urine, and severe inflammation. It may be best done with the delicate urethral lithotrite of Reliquet, although the insertion of the female blade behind the concretion is by no means easy. When the calculus is seated in the spongy portion of the urethra, Reliquet¹ advises that the instrument be brought in contact with it, the urethra behind it having been previously compressed by an assistant to steady it, when by bending the penis and keeping the convexity of the blade in contact with the side of the urethra, the beak may be slipped behind the concretion. The male blade

Fig. 165.



Fig. 166.

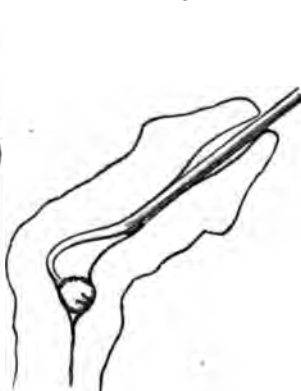
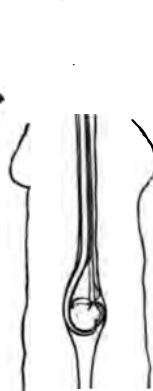


Fig. 167.



Introduction of Lithotrite and seizure of the Stone.

¹ *Traité des Opérations des Voies Urinaires*, Paris, 1871, p. 586.

being then protruded the concretion is broken up. These manoeuvres are represented in figs. 165, 166, and 167.

In the remarkable case of Dr. Mütter previously referred to, that gentleman succeeded in freeing the urethra by cutting off daily a piece of the stone, with a pair of small, strong, slightly curved, sharp-cutting forceps, expressly constructed for the purpose. As the urethra was very irritable, the operation was attended with some pain, but nothing serious ensued, and in a short time the entire cylinder was removed.

Excision, which becomes necessary when extraction fails, varies according to the situation of the foreign body. When the concretion is lodged deeply, as in the prostatic or membranous part of the canal, it is performed very much after the manner of Celsus, in cutting on the gripe, as it was called. The rectum having been thoroughly emptied by an enema, and the patient placed as in the operation of lithotomy, the surgeon introduces the fore and middle fingers of the left hand, well oiled, into the anus, and uses them to push the stone forward, to make it protrude and form a tumor in the perineum. An incision is then made, either of a lunated shape, as in the bilateral method, or, what is better, because more easy and simple, in the direction of the raphé of the perineum. When the concretion is fully exposed, it may either be pressed out with the fingers, or extracted with a blunt-hook or pair of forceps. In performing this operation, care must be taken to guard the rectum.

When the calculus is impacted in the navicular fossa, its removal is easily effected by incising the lower part of the urethra where this canal corresponds with the head of the penis. When the foreign body lies in that portion of the urethra which corresponds with the scrotum, incision must be practised with great caution, lest it be followed by infiltration of urine and all the bad consequences of such an accident. In such a case, I would advise immediate cauterization of the wound with nitrate of silver, and an avoidance of micturition for ten or twelve hours, to favor the deposit of lymph.

2. Foreign Bodies Introduced from Without.—Of foreign bodies introduced into the urethra from without, the number and variety are quite considerable. The occurrence is sometimes the result of accident; but, more frequently, it takes place through design, either of the patient himself, or of mischievous

and wicked persons, who take advantage of the helpless state of their intended victim. Bits of catheters, bougies, quills, pipe-stems, wood, straw, and other substances have been accidentally lodged in the urethra by individuals endeavoring to draw off their urine, relieve a stricture, or provoke onanism. Females, apparently from mere wantonness, or a desire to excite sympathy and commiseration, often introduce pebbles, cherry-stones, chicken-bones, bits of brick, pins, needles, and other articles, into the urethra.

Foreign bodies, introduced from without, produce various effects, according to the manner in which they are inserted, their nature, the distance which they have travelled, and the period of their sojourn. There is one feature which they all possess in common, namely, a remarkable propensity to migrate to the bladder, no matter what may be their form, size, or composition. The bladder, favored by the peristaltic action of the urethra, manifests, so to speak, in all cases of this kind, a disposition to swallow the foreign body, or to suck it in. In some cases the extraneous substance becomes impacted, and remains in the canal for an indefinite period, perhaps for many years, attended, it may be, with little inconvenience or functional disturbance. Occasionally, it forms the nucleus of a urinary concretion, or its surface becomes incrustated with earthy matter. When bulky, it gives rise to retention of urine, with inflammation of the urethra, severe pain, morbid erections, frequent micturition, rigors, and high constitutional disorder. Hemorrhage is liable to attend when the foreign substance has an unusually rough surface, or when it has been rudely inserted.

Finally, it occasionally happens, as was previously stated, that the escape of a concretion is prevented by an organic stricture. When the case is urgent, or admits of no delay, in consequence of retention of the urine, relief must be afforded either by dividing the stricture from within, and then extracting the calculus in the usual manner, or, when this is impracticable, by making an incision into the canal, embracing both the stricture and the foreign body.

Much tact and ingenuity are often required in extracting a foreign body introduced from without. This is especially the case when it has broken off low down in the passage, or when it has pierced its walls. Much difficulty may also result from

the peculiar nature or shape of the article. Thus, a hair-pin, inserted head foremost, and pushed out of sight, might greatly perplex, and completely baffle, a man unaccustomed to think for himself, or rely upon his own resources. Boinet, a French surgeon, being called to a case of this kind, had recourse to the following ingenious expedient: Taking hold of the penis, he bent this organ strongly upwards, at the same time that he made firm pressure upon the head of the pin, to prevent it from receding. By this manœuvre the points of the instrument were forced through the lower wall of the urethra; the two branches were then separated transversely, when one of them was cut off, and the other pulled out. The operation lasted only a few minutes, and was not followed by any unpleasant effects.

The late Mr. Avery, of London, by the following simple method, promptly succeeded, on one occasion, in extracting from the urethra of a gentleman, a hair-pin which had been pushed down the canal about an inch and a half, the two points looking towards its orifice. Having firmly grasped the pin, he squeezed the two ends of it together, while with the other hand he introduced a straight tube—a piece of catheter—which passed over the end of the pin, which followed the instrument as it was withdrawn, the elasticity of it keeping it firmly in its place when the pressure applied to it through the urethra was taken off.

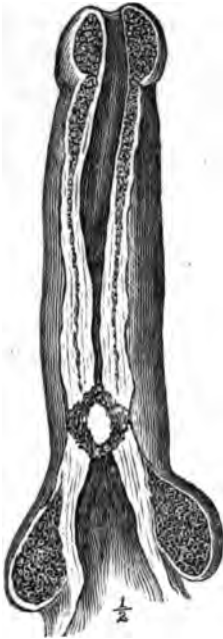
When the foreign substance is of a simple character, as the stalk of a plant, a toothpick, a needle, or a pin, it may, if it have not slipped too far back, be extracted with a pair of delicate forceps, as those represented in fig. 164. To render the success more certain, the penis should be held horizontally, and slightly on the stretch, otherwise it may be difficult to expand the blades of the instrument over the extremity of the intruder. Care should also be taken that the forceps do not pass between the substance and the wall of the urethra. Another precaution, not to be overlooked, is to apply pressure just behind the foreign body, to prevent it from receding during the attempts at extraction. Similar substances may be entrapped between the blades of expanding instruments, as Thompson's divulsor, as suggested by Dr. Keyes, of New York.

CHAPTER XII.

LACERATION OF THE URETHRA.

LACERATION, or rupture, of the urethra is produced by two varieties of causes, the one acting from without, the other from within. Under the first may be comprised falls, blows, and kicks upon the perineum, or the perineum and the penis; under the second, the violent straining which attends micturition in stricture, injury done by the lodgment of a calculus, and the rude, forcible, or injudicious use of catheters, bougies, and sounds.

Fig. 168.



Shot Perforation of the Urethra.

Laceration of this canal has occasionally taken place under a violent erection, especially if the penis, while in this condition, be struck accidentally against a hard, resisting body. It has also been known to happen during coition and during convalescence, after attacks of fever.

In the majority of instances, the laceration is caused by falls from a considerable height, in which the perineum strikes against some sharp, angular, or projecting body, while the thighs are more or less separated from each other. From the peculiar character of their occupation, sailors, masons, carpenters, painters, house-cleaners, coachmen, and teamsters are more prone to this kind of injury than any other classes of individuals. Sometimes the laceration is occasioned by a blow or kick upon the perineum, from the foot of a man or a horse; and it may also be produced by the person being thrown forcibly forward on the pomel of his saddle. Laceration of the urethra

by balls is usually complicated by wounds of the scrotum, testes, thighs, buttocks, groin, perineum, and penis, as in fig. 168, taken from a specimen in the Army Medical Museum.

Of the internal causes of laceration of the urethra, the most common are vesical calculi, bougies, and catheters. After lithotrity, serious injury is often inflicted by sharp, angular fragments of stone impinging against, and rupturing the mucous membrane; and the same circumstance occasionally occurs when a small, but rough calculus, in its attempt at extrusion, becomes impacted in the posterior portion of the canal. The mischief which is sometimes done to the urethra in the rude introduction of the catheter, bougie, and sound, is familiar to every one.

The laceration varies, as to its seat, according to the nature of the vulnerating body, or the character of the exciting cause. When it results from a blow, fall, or kick upon the perineum, it usually occurs on a level with the deep perineal fascia, in which location the rent is made by the urethra being violently driven against the subpubic ligament; occasionally, it is situated behind this point; and sometimes, although rarely, it is met with in the spongy portion of the canal. When the rupture is caused by the passage of a calculus, or of an instrument, it may be seated in any region of the urethra, from the neck of the bladder to the external orifice.

There is no uniformity in regard to the extent of this injury. While in some instances it is extremely slight, presenting itself perhaps merely in the form of a minute fissure, slit, or crevice, in others it is so great as to embrace one-half, two-thirds, or even the entire circumference of the tube. In the latter case, the ends of the divided canal frequently lose their apposition, and thus oppose a serious, if not an insurmountable, barrier to the introduction of the catheter. The laceration may be limited to the mucous membrane, or it may involve along with it all the tissues which intervene between the canal and the external surface, according to its seat, and the nature of the vulnerating body. Finally, it may be solitary or multiple, longitudinal, transverse, or oblique.

The symptoms of this affection are generally sufficiently characteristic. The most prominent are, pain in the affected part, hemorrhage, inability, with constant desire, to void the urine, or the discharge of this fluid in a small and imperfect manner, discoloration and swelling of the perineum, or of the perineum, scrotum, and penis, and great difficulty, if not utter impossibility, of introducing the catheter. The patient is weak

and faint, perhaps sick at the stomach, and labors under all the effects of a severe shock.

The pain is usually in direct proportion to the extent and violence of the accident. It is of an acute, sharp, cutting character, is generally circumscribed or limited to the seat of the injury, and is greatly aggravated by the passage of the urine, by motion, and by pressure upon the perineum. It is not intermittent, but constant, and is sometimes compared by the patient to the sensation produced by the contact of molten lead. Although originally circumscribed, it soon extends to the circumjacent parts, as the testicles, groins, thighs, anus, and the bladder, and becomes so severe as not to allow the poor sufferer a moment's comfort.

The hemorrhage varies in quantity from a few drops to a number of ounces, according to the extent of the injury sustained by the urethra and the circumjacent textures. The loss of a pint of blood soon after the accident is no unusual occurrence. The discharge, which is generally transient, sometimes continues for a number of days, and is always aggravated or reproduced at every attempt to introduce the catheter. Occasionally the blood, instead of issuing at the external orifice of the urethra, escapes at the abnormal opening, lodges in the surrounding connective tissue, or passes back into the bladder, where it is either retained, or, as most commonly happens, dissolved, and excreted along with the urine.

Few patients affected with rupture of the urethra, are able to void their urine with anything like their accustomed facility. On the contrary, there is usually a great deal of difficulty, accompanied with excessive pain and straining, and a constant desire to relieve the bladder. In many cases, indeed, there is complete retention from the very beginning, caused either by the loss of apposition of the divided ends of the canal, by the presence of coagulated blood, or by the disabled condition of the bladder itself. Sometimes, again, although rarely, there is total suppression of urine.

The discoloration of the affected part may occur instantly, or not under a few hours. It varies from light red to deep purple or black, and involves not only the perineum, but frequently also the scrotum and the penis. The immediate cause of this symptom is an extravasation of blood into the connective tissue,

the quantity of which varies, in different cases, from a few drachms to several ounces. When considerable, it must necessarily lead to proportionate distention of the affected region, which is still further increased, in a short time, by the ordinary products of inflammation. Although there are few cases of laceration of the urethra by external violence in which there is not some degree of discoloration of the integuments, it is worthy of remark that the parts occasionally present an entirely natural appearance.

If an attempt be made in this affection to draw off the urine, the catheter will either not enter the bladder at all, or it will meet with more or less resistance at the seat of the injury. Its arrival at this point will be indicated by a peculiar grating sensation, which no experienced hand can possibly mistake. When the laceration is considerable, the extremity of the instrument will be apt to take a wrong direction, or to become entangled by the edges of the wound. If the canal be completely severed, and the divided ends have lost their parallelism, the greatest difficulty will be experienced in performing the operation; and, in many instances, no surgeon, however skilful, will be able to succeed. Should the instrument fortunately reach the bladder, its withdrawal will generally be followed by a renewal of the hemorrhage.

Another bad consequence of laceration of the urethra, especially when produced by external causes, is extravasation of urine into the surrounding connective tissue. When the accident occurs in the posterior part of the canal, in front of the triangular ligament, the fluid generally distends the perineum, and thence proceeds forwards, underneath the dartos, into the scrotum and spongy body of the penis. In such a case, violent inflammation, often followed by sloughing, and even death, is an inevitable result.

When a man has received a fall, blow, or kick upon the perineum, or the genitals, and is almost immediately after seized with a sharp, cutting, or burning pain in the region of the injury, and a discharge of blood from the urethra, it may be pretty positively affirmed that he is laboring under the effects of a laceration of this canal. The diagnosis is fully confirmed, when, superadded to these symptoms, there is a frequent desire to empty the bladder, with an inability to pass a drop of water.

The peculiar grating sensation, previously alluded to, as being communicated to the hand on attempting to introduce a catheter, is another valuable sign, almost of itself characteristic of the nature of the accident. A mere contusion of the urethra, unaccompanied by any rupture, is easily distinguished from the latter affection by the absence of hemorrhage and of the severe burning pain which results from the contact of the urine. In neither case can any positive conclusions be drawn from the character of the constitutional symptoms, which are often as severe in one of these lesions as in the other.

The danger of this lesion is usually in direct proportion to its extent, and the state of the bladder at the time it is inflicted. If the laceration is considerable, and the patient has not made water for some time, infiltration will be almost certain to occur, and to be followed by all the mischief which the fluid is capable of producing whenever it comes in contact with tissues which are not accustomed to its presence. The usual consequences of such an accident are, severe pain and swelling of the affected parts, retention of urine, violent rigors, great depression of the pulse, delirium, excessive thirst, and constant restlessness. If the parts be not relieved by early and free incisions, they soon fall into gangrene; hiccough and subsultus ensue, and the patient dies in great agony, generally before the eighth day, and sometimes as early as the fourth or fifth.

In slight cases, the prognosis is always more favorable; but even here the patient can scarcely be considered as being out of danger as long as there is any possibility of urinary infiltration. Apart from this contingency, a wound or rent of the urethra is attended with no more hazard than a similar injury in any other region of the body; it heals quite as readily, and does not give rise to any more suffering. The injury, even when comparatively slight, is sometimes followed by great contraction of the corresponding portion of the canal.

In laceration of the urethra by balls, the danger increases with the distance of the injury from the external meatus, on account of the augmented risk of infiltration of urine. The usual causes of death after this class of injuries are well shown by a reference to the experience derived from our late war. Of 105 cases of shot wounds of the urethra, 22 were fatal, 8 from

urinary infiltration, 9 from surgical fever and profuse suppuration, including 3 complicated by fracture of the thigh-bone; 3 from hemorrhage; and 1, each, from phlebitis and tetanus. Of the cases that recovered, 26 were affected with stricture, and 38 with fistules, of which 16 involved the pendulous urethra, 17 the scrotal or perineal portion of the canal, and 5 the deep portion of the canal, along with the rectum.

The treatment of this accident must be prompt and decisive, otherwise great, if not irreparable mischief must inevitably befall both part and system. As the chief danger consists in the escape of the urine by the breach of the urethra into the connective tissue of the perineum and scrotum, every means calculated to obviate such a calamity should be instantly put in requisition. If the rent be small, the first thing to be done is to endeavor to pass a catheter into the bladder; an operation which is to be conducted in as gentle and cautious a manner as possible, lest the point of the instrument be intercepted by the wound, and thus take a wrong direction. The catheter should rather be over than under the ordinary size, so that, when introduced, and fixed in its place, it may slightly distend the parietes of the canal, and thereby prevent the urine from flowing between the contiguous surfaces. The object of this proceeding is to carry off the water from the bladder as fast as it arrives there, without permitting it to come in contact with the lacerated surface. Unless this be attained, the treatment must not be thought of, much less employed. The instrument used, may be of silver or vulcanized caoutchouc, although I always myself prefer the latter on account of the less necessity for changing it after it has been some time in the bladder, and its adaptability to the normal curve of the urethra.

If, on the contrary, the rent be very extensive, as is indicated by the hemorrhage and other symptoms, the only rational treatment is to make a free incision into the part, to afford a free exit to the urine, which will otherwise be sure to insinuate itself rapidly into the connective tissue of the perineum and scrotum. The operation is conducted upon the same principles as that of external urethrotomy, without a guide. If the urethra be completely and cleanly divided across, its ends should be approximated with a single suture, and union be

favoured over a soft gum catheter, the end of which should be kept open so as to afford a constant escape for the urine, and prevent its passage along the side of the instrument. Under ordinary circumstances, a catheter need not be retained in the bladder; but after the more acute symptoms have subsided, a full-sized sound should be passed daily to guard against undue contraction of the cicatrizing wound.

The operation here referred to is easy of execution, and indispensable to the safety of the patient; it places him at once in a state of comparative security, by preventing urinary infiltration, and affording nature an opportunity of repairing the breach at the least possible expense of time and suffering. No danger whatever is to be apprehended from its performance; and the wound usually heals in a very short time, without the aid of any dressing.

If some hours have elapsed since the occurrence of the injury, as not infrequently happens when the patient, from ignorance or other causes, neglects to send for surgical aid, and it be apparent, from the nature of the symptoms, that there is urinary infiltration, no time is to be lost in making numerous and deep incisions into the affected parts. A free outlet must be afforded to the pent-up fluid, and to the inflammatory products which so soon succeed to it, otherwise extensive sloughing and even death may be the consequence. Hesitancy, in a case of this kind, must yield to decision; tardiness to promptness; timidity to boldness. The patient is saved or lost in a moment.

The treatment above mentioned, as applicable to the various contingencies connected with this lesion, may often be advantageously aided by general and topical bleeding, purgatives, demulcent drinks, the warm bath, anodynes, fomentations, and poultices. Much judgment is generally required in the adaptation of particular remedies to particular cases. When infiltration is present, depletion is usually badly borne, and should be practised with the greatest circumspection.

It has been proposed in laceration of the urethra, followed by obstinate retention of urine, to puncture the bladder through the rectum or the abdomen. To such a proceeding, which has unfortunately been too often carried into effect, there is great objection; for, even supposing that it relieves the distended

organ, it does not strike at the main evil, the urinary infiltration of the surrounding parts. It is better, therefore, always to incise the affected tissues as freely as possible, cutting down to the urethra, and laying it open so as to afford full vent to the urine.

The contraction of the canal which sometimes succeeds to this injury is to be managed upon the same principles as a traumatic stricture.

CHAPTER XIII.

MALFORMATIONS AND IMPERFECTIONS OF THE URETHRA.

THE urethra is liable to a variety of malformations, which, although exceedingly rare, ought, nevertheless, to be known, on account of their practical relations. The most common of these congenital vices are 1st, malformations of the external meatus; 2dly, absence, contraction, or obliteration of the canal; 3dly, duplicity of the urethra; 4thly, changes of form; and 5thly, deviations from the normal direction.

1. The urinary meatus is occasionally situated considerably higher up or lower down than in the normal state; and in some instances, and these are by no means infrequent, it is placed upon the upper or under surface of the penis; in the former case, the malformation constitutes what is called epispadias, in the latter, hypospadias. I have seen no example in which the orifice was situated at the side of the median line of the gland. The urethra sometimes terminates at the inferior portion of the abdomen. Haller refers to an instance in which it opened in the inguinal region; and Geoffroy Saint-Hilaire mentions one where the meatus was situated in the right groin.

The meatus, instead of presenting itself in the form of a vertical slit, is sometimes of a rounded, circular, or ovoidal configuration. Its size may also be unnatural. Thus, it is sometimes remarkably large, or so small as hardly to admit the extremity of an ordinary silver probe. In the former case, which is rather rare, it constitutes a predisposition to gonorrhœa and chancre, from the fact that it offers an unusually wide surface for the contact and lodgment of the specific virus.

The meatus is sometimes double, and even triple; a circumstance which has led to a belief, at one time common enough among anatomists, of the existence of a double urethra. In the celebrated case of Fabricius Hildanus, so often cited in support of this opinion, there were two openings on the head of the penis, but only one canal. Vidal relates an instance in which there were three orifices, two of which pierced the gland, while

the other was situated at the lowermost part of the navicular fossa, nearly at the base of the frenum. The latter was quite capacious, and afforded vent both to the urine and the semen; the rest were very small and contracted, and permitted the urine to pass only when this fluid was ejected with unusual force. I have met with several instances of double meatus, in none of which, however, more than one opened into the urethra, the other ending in a blind pouch. Such a condition generally represents the lightest grade of hypospadias, the normal opening being denoted by a gutter two or three lines deep.

The orifice is occasionally occluded, either partially or completely. In the former case, the narrowing may be effected by an unusually small opening with inverted edges; in the latter, by an extension of the mucous membrane, or of the mucous membrane and a small quantity of the proper structure of the gland.

A similar arrangement occasionally exists in the urethra of the female. A very rare and interesting case of membranous closure of this tube, associated with patency of the urachus, was observed by Berthélemi Cabrol, of Montpellier, in a girl eighteen years old. The urine had escaped, ever since birth, at the umbilicus, which projected about four inches from the abdomen, and exhaled an intolerable stench. A very similar case is recorded by Pitha.

2. The urethra may be absent. Of this occurrence the best marked example is seen in that variety of exstrophy of the bladder in which the urine and semen are discharged above the pubes. This species of malformation is exceedingly rare, and is necessarily accompanied with impotence. The canal in question is sometimes preternaturally narrow, or completely occluded. The defect may involve the entire canal, or it may be limited to a particular portion. Jules Cloquet met with an instance in a new-born child, in which the contraction existed at the middle of the urethra, and was upwards of an inch in length. Complete atresia, without deformity of the penis, can, however, scarcely exist, and a careful examination will disclose a very minute orifice somewhere along the course of the inferior wall of the urethra, and behind the corona of the gland. Hence, these cases must be regarded simply as examples of imperfora-

tion of the glandular portion of the canal, with a light grade of hypospadias.¹

The passage is occasionally closed by a prolongation of the mucous covering of the head of the penis; or by an internal septum, formed by a duplicature of the lining membrane; or, finally, by a sort of fibrous substance. These varieties of occlusion of the urethra bear the greatest possible analogy to those of the rectum, and require the same modes of treatment for their relief.

3. Many authors speak of what they regard as a double urethra; but there is no instance of a well authenticated character, which tends to show that there has ever been two distinct channels for the transmission of the urine. The existence of a second canal in the median furrow of the back of the penis is due either to the displaced openings of the ejaculatory ducts, as in the cases recorded by Vesalius, Cruveilhier, and Testa, or to deviation of the prostatic ducts, with or without aberration of the anterior commissure of the gland, to which reference is made at page 439. In a solitary instance of apparent double urethra, the second passage, seated on the inferior surface of the penis parallel with the urethra, was found, by Monod, in a monstrous foetus, with imperforate anus, to be nothing more than a fecal fistule.

4. The urethra is liable to changes of form. These seldom pervade the entire canal, but are limited to particular portions of its extent. Of these, the navicular fossa is, perhaps, most frequently affected. This part, which is naturally very wide, is sometimes absent, so that the spongy portion of the urethra is throughout of the same uniform dimensions. At other times, although very rarely, the fossa is remarkably dilated, or expanded into an elongated pouch, which may thus serve as a temporary reservoir for the urine, the seminal fluid, and even calculous concretions, especially when it happens to be conjoined with an unusually narrow meatus. If, on the contrary, the meatus is very capacious, as when it extends as far as the base of the gland, constituting the first degree of hypospadias, it may form a serious inconvenience, inasmuch as it predisposes the part to the venereal

¹ Vide, Rauchfuss, *St. Petersburger Med. Zeitschr.*, Bd. ii., 1862, p. 167; Stilling, *Deutsche Klinik*, 1864, p. 319; and Le Fort, *Gaz. Hebdom.*, 1864, p. 593.

infection by affording lodgment to gonorrhœal and chancrous matter.

The bulbous part of the canal is occasionally unnaturally dilated, forming a species of cul-de-sac, well calculated to arrest the point of the catheter, and impede its progress towards the bladder. In some cases, very few, however, in number, this part presents an unusually projecting septum, equally calculated to embarrass the operator.

The sinus in front of the verumontanum is sometimes so much enlarged as to be capable of receiving the end of a very large catheter; and a similar expansion is occasionally seen at each side of this crest.

In some instances, the verumontanum is prolonged much farther back than usual, giving rise, by a species of expansion, to two lateral folds, which are continuous in front, and resemble two little valves. An analogous arrangement sometimes exists towards the membranous portion of the urethra, but in this case the concave margin of the valve-like process looks towards the bladder instead of forwards. This variety of malformation, which is probably sometimes the result of disease, was first delineated by Langenbeck in his memoir on lithotomy, and has been particularly noticed by Velpeau in his Surgical Anatomy. Lisfranc states that he has several times seen a depression between the two lateral lobes of the prostate. In one of his cases, the abnormal cavity was two lines in length, a line in width, and a line and a half in depth; the gallinaginous crest was deformed, and directed towards the right side.

5. The urethra sometimes deviates from the normal direction. In the infant, in whom the bladder is elongated, and situated, in a great measure, in the abdominal cavity, the canal is a good deal more curved than in the adult. It is also influenced, in some instances, by the height and shape of the pubes. In the fœtus, according to Chaussier, its curvature is often augmented by the distention of the rectum by the meconium.

Cases occur in which the canal terminates in the bladder a little lower down than usual; a circumstance which materially diminishes the bas-fond of the bladder, and predisposes to incontinence of urine. The prostatic portion of the urethra occasionally runs through the gland of that name in such a manner that nearly the whole of that body lies above it. In such a case, the

urethra is in close contact with the rectum, which must thus be endangered in the operation for stone. In some instances the reverse of this is the case, the canal being lodged in a mere gutter in the upper surface of the gland. I am not aware that any lateral deviations have been observed; if any occur, they must be exceedingly infrequent.

One of the most common, and at the same time one of the most serious, effects of congenital obstruction of the urethra is excessive distention of the bladder, with enlargement of the ureters, and organic disease of the kidneys; consisting, generally, in cystoid dilatation of their substance. These alterations also show, what has not been admitted by all physiologists, that micturition is naturally performed before birth, and that the secretion of urine may be carried on even after the renal tissues are almost entirely destroyed.

Many of the defects now described are, of course, irremediable, and are, on this account, more interesting to the physiologist and pathologist than to the surgeon. There are some of them, however, which admit of relief, and which, therefore, require further notice in this place.

Occlusion of the external meatus of the urethra must be speedily remedied by an operation, otherwise the urine may accumulate to so great an extent as to lead to a rupture of the canal, with an infiltration of the fluid in the connective tissue. Unfortunately the existence of this malformation cannot always be at once determined, on account of the narrow and elongated condition of the prepuce, which prevents the inspection of the affected part. It is only, in general, in consequence of the absence of micturition, and the presence of a small, elastic, and translucent swelling behind the head of the penis, that attention is directed to the seat of the malformation, and the proper means of overcoming it. When the occlusion is caused simply by a duplicature of the lining membrane, forming a sort of hymen, septum, or diaphragm, a vertical incision in the direction of the natural outlet will generally suffice to afford relief; the precaution being observed to keep the edges of the wound apart by the daily introduction of the steel bougie. When, on the contrary, the imperforation depends upon the presence of a fibrous tissue, and reaches a considerable distance back, the operation will be more serious, and will require to be performed



with a trocar, the canula of which, or a proper substitute, may be employed afterwards to keep the canal pervious.

In the extraordinary case observed by Cabrol, where the occlusion was combined with patency of the urachus, a cure was effected by dividing the abnormal septum, and retaining a catheter in the bladder for conducting off the urine. The day after the operation, the surgeon threw a strong ligature around the tumor at the navel, and then cut off the redundant portion, the raw surface being immediately touched with the actual cautery. As soon as the eschar was detached, the sore was dressed with a healing salve, and in less than a fortnight the cicatrization was completed.

When the occlusion depends upon union of the pudendal lips, a tedious dissection may be necessary to expose the concealed outlet. The incision should be made directly along the middle line, and the operation may be finished, if necessary, with the trocar.

The malformations known under the names of hypospadias and epispadias are defects of a serious character, as they entail not infrequently great suffering and inconvenience upon their unhappy subjects. From the manner in which the urine is discharged, the neighboring parts are kept continually in a tender, irritable, and excoriated state; at the same time that they exhale so unpleasant an odor as to render the patient disagreeable both to himself and to those around him. But, what is worse than all, they often render the individual impotent, and thus disqualify him for matrimony. This must necessarily be the case whenever the defect exists far back, and is so great as to allow the whole of the semen to escape at the preternatural aperture; or where the fissure extends all the way from the pubic symphysis, or the perineum, to the head of the penis. Examples of this description are, therefore, of the deepest interest in a medico-legal point of view; for, although the subjects of them may be able to copulate, yet, from their inability to project the semen into the uterus, the intercourse cannot prove fruitful. When the malformation is associated with shortening and incurvation of the penis, or excessive length of the member with great redundancy of the prepuce, even copulation may be impracticable. Hypospadias and epispadias occasionally, although rarely, coexist.

Hypospadias presents itself under three varieties of form, of which the most common, as well as the most simple, is the one in which the urethra opens just behind the frenum; it is generally accompanied by a fissure of the gland, which is destitute of a natural orifice, and has a broad, flattened, and unseemly appearance. In the second form, the canal opens at some point intermediate between the first and the scrotum; and in the third, the urethra terminates at the latter organ, which is cleft at the middle line, so as to form two lobes, closely resembling the pudendal lips. In the second variety of the malformation, the urethra extends occasionally as far forwards as the crown of the penis, where it ends in a sort of cul-de-sac.

In the more simple variety of hypospadias, a cure may be attempted by paring the edges of the fissure, and uniting them by means of interrupted sutures over a catheter introduced into the bladder. The sutures should be placed near each other, and the intervals between them should be carefully closed with strips of isinglass plaster. They should not be removed before the end of the sixth day, by which time the greater portion of the wound will have pretty firmly united. Any part that may remain unclosed may be touched with nitrate of silver, to induce the formation of healthy granulations. The same mode of proceeding is adopted when the fissure exists farther back, only that it will be necessary, in addition, to establish an artificial urethra by means of a trocar, pushed in the direction of the natural channel. The canal thus made is kept pervious by the catheter, until it has received a mucous lining, after which the instrument should be worn a few hours every day for a number of months, to prevent undue contraction, which is so apt to follow all operations of this kind. When there is much deficiency of the parts, autoplasty may be necessary, the gap being filled up by borrowing a piece of integument from the scrotum or perineum.

When hypospadias is complicated with great shortening of the spongy substance of the urethra, accompanied with incurvation of the penis, the defect may sometimes be remedied by cutting out a V-shaped piece of the cavernous bodies, at their dorsal surface. Such an operation, which was performed successfully, many years ago, by the late Dr. Physick, and also, in 1844, by Professor Pancoast, of Philadelphia, I have practised several times with the most gratifying results. It may be divided into

three stages. In the first, the skin of the dorsal surface of the penis is pinched up longitudinally, and then divided transversely by transfixing its base. Secondly, the cavernous bodies being thus exposed, a wedge-shaped piece, from half an inch to an inch in length, according to the extent of the incurvation, and embracing about two-thirds of the thickness of the two cylinders, is excised with the bistoury, by carrying the instrument in a sloping direction, first from behind forwards towards the gland, and then backwards towards the pubes. The hemorrhage is usually slight, and ceases of its own accord. Lastly, the edges of the triangular wound are tacked together by several points of the interrupted suture; after which the penis is placed in a hollow, well-padded splint, to which it is secured by an appropriate roller. Cold water dressings are applied, to prevent undue inflammation, and the stitches are removed at the end of the fifth, sixth, or eighth day, according to the degree of the re-union.

In a case of hypospadias, accompanied with considerable incurvation, which was under my charge some years ago, I dissected off the integuments at the seat of the bend, and then made four horizontal incisions, at intervals of several lines, into the fibrous sheath of the cavernous bodies, in order to restore them to their normal length. The operation had the effect intended, but, in consequence of the difficulty of keeping the organ extended, there was a reproduction of the curve within a very short period after the cicatrization of the parts.

In epispadias, which is far more rare than hypospadias, the malformation affects the dorsal surface of the penis, and likewise presents itself under several varieties of form. In the subjoined sketch, fig. 169, copied from Liston, the fissure extends from the pubic symphysis to the extremity of the penis, which has a singularly flattened and distorted appearance. The mucous membrane, in this condition of the parts, is generally abnormally pale, and its lacunæ

Fig. 169.



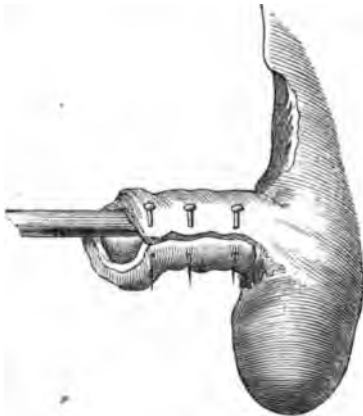
Epispadias.

are very distinct. In the more simple forms of epispadias, the urethra terminates a short distance behind the gland of the penis, which is usually more or less disfigured.

The treatment for the rectification of these defects is to be conducted upon the same principles as that for the different varieties of hypospadias, already described. In Mr. Liston's case, in which nearly four inches of the urethra were exposed, a complete cure was effected in a few days. The operation consisted in paring the edges of the cleft thoroughly, and bringing them together over a catheter, by means of many points of the twisted suture. Union by the first intention took place in the entire track, except near the pubes, where a very minute fistulous opening remained, through which not more than a drop of urine oozed during micturition. This was afterwards closed with a heated needle. The organ was in all respects, and for all purposes, as perfect as could be desired.

A far better procedure for closing in the urethra is that of Nélaton, which has been variously modified by other surgeons.

Fig. 170.



Nélaton's Operation for Epispadias.

This consists in making a longitudinal incision on each side, at the junction of the skin and mucous membrane, and refreshing the edges so as to make raw surfaces, nearly an eighth of an inch in width, to which are attached the sides of a flap turned down from the hypogastric region. To maintain this flap in position and prevent its retraction during the cicatrization of the abdominal wound, it is covered by a crescentic flap taken from the scrotum, through which the penis is

slipped, so that its raw surface lies in contact with the raw surface of the first flap, to which it is fastened by twisted sutures, as represented in fig. 170, from Richard. Whatever operation may be selected, it is important to make a perineal outlet for the urine, through which its contact with the edges of the wound may be prevented.

CHAPTER XIV.

LESIONS OF THE GALLINAGINOUS CREST.

THE gallinaginous crest, or, as it is denominated, the verumontanum, is liable, from its situation at the floor of the prostatic portion of the urethra, and from its intimate relation to the orifices of the ejaculatory and prostatic ducts, to inflammation and its consequences. Whether these affections ever exist as independent affections, or whether they always occur in association with disease of the neighboring structures, is not clearly ascertained.

Acute inflammation of the gallinaginous crest is most commonly induced by an extension of gonorrhœal inflammation, by stricture of the urethra, by disease of the ejaculatory ducts, and by the presence of prostatic calculi. It may also be excited, there is reason to believe, by rough horseback exercise, by inordinate sexual indulgence, and by the injudicious employment of instruments. Stimulating diuretics, such as cantharides and spirit of turpentine, may also give rise to it. The crest, when thus affected, is of a florid appearance, of a soft, spongy consistence, and slightly increased in volume, in consequence of interstitial deposits. Inflammatory new material is sometimes deposited on its surface, either in the form of minute points, or as a distinct layer.

There are no signs by which, in the present state of the science, it is possible to diagnosticate this affection from disease of the adjacent parts. The spasm, pain, and frequent desire to urinate, together with the increased secretion of mucus which accompany it, also attend inflammation of the prostate gland and the neck of the bladder, and are, therefore, valueless as diagnostics. The circumstance is, fortunately, of little moment in a practical point of view, inasmuch as the treatment is essentially the same, in whichever of these structures the malady is located. Under the influence of antiphlogistics, the lesion rapidly subsides, and the part gradually recovers its original character. Neither

ulceration nor gangrene is likely to occur, unless the inflammation has been induced by external violence, attended with extensive laceration of its tissues.

The gallinaginous crest is liable to hypertrophy, or chronic enlargement; the result, doubtless, of inflammation and interstitial deposits. In stricture of the urethra and hypertrophy of the prostate, I have repeatedly seen it from three to four times the normal volume, at the same time that it was considerably indurated, and changed in its configuration. Occasionally, it deviates a good deal to one side. The size which this body sometimes attains is almost incredible. Thus, in an instance recorded by De Blégny, it formed a projection as big as a small walnut. The seminal fluid was of a thick, vitiated quality, and the ejaculatory canals were choked up with small, hard, spherical concretions, as large as peas. The patient, a widower, sixty years of age, and the father of several children, contracted a second marriage, but he never could produce an emission, although he had perfect erections. In an old man who died of retention of urine at the Hôtel-Dieu, in Paris, the verumontanum was still larger than in the case of De Blégny. The hypertrophy was associated with profound disease of some of the other portions of the urinary passages, and it was, therefore, impossible to ascertain the amount of influence it exercised during the patient's life.¹

When the verumontanum is much enlarged, it is generally of a pale, mottled complexion, more or less deformed, and considerably augmented in its consistence. Its mucous membrane is thickened, villous, and traversed by large vessels; while its proper substance is of a whitish, or grayish aspect, intersected by fibrous bands, and so firm as almost to grate under the knife.

Hypertrophy of this body, existing in any considerable degree, must necessarily obstruct the flow of urine, and interfere with the introduction of the catheter. In this respect, in fact, its effects must be similar to those produced by hypertrophy of the prostate, especially of its middle lobe. From its intimate relations with the ejaculatory ducts, it must also impede, if not wholly prevent, the discharge of semen, and may thus become a cause of impotence. This was evidently the case in the indi-

¹ Civiale, *Traité Pratique des Maladies des Organes Genito-Uriinaires*, deux. ed., partie 2de, p. 234.

vidual whose history has been narrated by De Blégny, and which is alluded to in a previous paragraph. Sir Everard Home met with an instance in which the orifices of the ejaculatory ducts were covered over by a false membrane.

Hypertrophy of the urethral crest has no symptoms of its own, and hence the utmost uncertainty must always exist with regard to its diagnosis. The phenomena which attend it must be such, in the great majority of instances, as indicate obstruction to the flow of urine, and the passage of instruments accompanied, in all probability, by an increased discharge of glairy, viscid mucus. A careful exploration with the sound, aided by the finger in the rectum, may throw some light upon the case, by pointing out the precise seat of the enlarged body ; but, in general, even this fails, and the practitioner is, therefore, obliged to abandon himself wholly to conjecture. This being the case, it is obvious that the treatment of the affection must be conducted according to the common rules of surgery ; or, more properly speaking, upon the same principles as chronic disease of the prostate gland, the neck of the bladder, and the posterior portion of the urethra.



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